HYPACK®

HYDROGRAPHIC SURVEY SOFTWARE

USER MANUAL

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CHAPTER 1

Introduction

WELCOME TO HYPACK®

Welcome to HYPACK®!

HYPACK, Inc. develops Windows®-based software for the hydrographic and dredging industry. It provides hydrographic surveyors with all of the tools needed to design their survey, collect data, process it, reduce it, and generate final products.

Whether you are collecting hydrographic survey data or environmental data or just positioning your vessel in an engineering project, HYPACK® provides the tools needed to complete your job. With users spanning the range from small vessel surveys with just a GPS and single beam echosounder to large survey ships with networked sensors and systems, HYPACK® gives you the power needed to complete your task in a system your surveyors can master.

Different modules include:

Module	Packages Included
Single Beam and Side Scan Survey Module	Preparation and Data Collection
Multibeam Survey Module	Preparation and Data Collection
Single Beam and Side Scan Processing Module	Editing and Reduction of Single Beam and Side Scan Data
Multibeam Processing Module	Editing and Reduction of Multibeam Data
Final Product Module	Generation of Final Products
DREDGEPACK® Module	Monitoring and data collection specialized for dredge operations

Additional restrictions on which modules are available may be configured by your system administrator who may set user permissions.

More Information:

- "License Types and their Programs" on page 10-58
- "User Permissions" on page 1-12

HYPACK® Minimum System Requirements

The following are the *minimum* requirements to run these programs. If you are working with multibeam or side scan data, a good gaming computer (large RAM, multiple CPU cores and fast graphics) will be much more efficient.

TABLE 1-1. *Minimum System Requirements*

		HYPACK®	HYSWEEP®
Operating System		Windows XP SP3, Vista, 7	
Pentium Coprocessor	XP	500 MHz	1 GHz
	Vista, 7	1 GHz + DirectX 9 capable graphics processor	
RAM[a]	XP, Vista, 7	3 Gb RAM	
Minimum Serial Interface[b]	Laptop	PCMCIA to Serial	
	Desktop	PCI to Serial	
Analog Interface[c]	XP	National Instruments 6024E (PCMCIA)	
	XP, Vista, 7	National Instruments USB-6221 (USB)	
Hard Drive		20 Gb	120 Gb with backup[d]
Monitor	Resolution	800x600	1024x768
	Colors	32-bit	

	HYPACK®	HYSWEEP®
Dual Screen Support	(Optional) is accomplished through special video cards. HYPACK® can use virtual screens" which cross several monitors, provided the hardware is correctly installed. This enables you to have a "Survey" monitor and a separate "Helmsman" monitor.	
Dongles	Dongles are USB devices required by HYPACK® to activate the program modules associated with the license purchased. The Standard HYPACK® key will run all program modules required for single beam or side scan projects, and serves as a basis for the add-on HYSWEEP® and DREDGEPACK® licenses. **NOTE:** Only the Unikey dongles are supported by Hypack_2011. For more information regarding key types and prices, contact HYPACK, Inc..	

a. Increased RAM will speed the performance of many programs significantly. In this case more is better.

b. USB to Serial adapters *are NOT satisfactory* for our purposes, particularly for interfacing with your GPS.

c. Required only if you are using an analog device.

d. Multibeam and side scan data files are very large. Depending on your project, you may need a larger hard drive

NETWORK SYSTEM REQUIREMENTS

Users can share project data across a network. You can elect to share projects on your computer with other users on your network or you can use a designated computer as a central storage facility and all users can access projects from that location.

Unless you specify otherwise, HYPACK® still defaults to the same directories in your Hypack\Projects*ProjectName* directory so, if you prefer, you can continue using HYPACK® in the same manner as previous versions, without the network capability.

NOTE If you decide to have a computer act as your storage location, that computer does not need a HYPACK® dongle. Only computers that actually run HYPACK® require a dongle.

The network capability was developed to access and share your projects in the office. During SURVEY, it is possible to load a network project

and save the data directly back to the network computer. *HOWEVER, we recommend that you only log data to the same computer that is running the Survey program.*

There are some system rules that must be followed for this to work completely. All further references in this manual to working with projects over the network will assume that these conditions have been met.

- **All computers to which the project refers must stay on the network**. If your project refers to a computer that has been disconnected from the network, those files will be listed in the Project Files and Data Files lists, but they will be marked with a red 'X' to indicate that they are unavailable. Of course, if the computer with the project file is off of the network, no one can open the project at all!
- **All computers with files included in the project must share those directories with both read and write capabilities** through the Windows® operating system. An unshared directory is as unavailable as if the computer was turned off. A read-only file can not interact with the other files in the project in order to do the work that you are trying to accomplish.
- **All files included in the project must remain in the same location.** If you move files, you must reload them to your project. Otherwise, the file will be marked with a red X indicating that it is "unavailable".

INSTALLATION

HYPACK® is delivered on a CD-ROM. To install the package, place the CD-ROM in your CD-ROM drive. You must be in administrative mode.

Auto-start: Many computers will “Auto Detect” the presence of the CD-ROM and automatically begin the installation process.

Manual start: Some computers do not automatically detect the CD-ROM.

1. **Right-click on the Start Button and select Explore**.
2. **Double-click the "Setup.exe" file from the CD-ROM Directory.** The installation program will begin. Follow the on-screen directions until the screen says the installation is complete.

SYSTEM SETTINGS

There are a few system settings that affect the proper function of HYPACK®. For best results, check the following options before you begin.

- Windows® User Account Controls
- Windows® Regional Options
- Windows® 7 Data Execution Prevention setting
- Firewall

USER ACCOUNT CONTROLS IN WINDOWS® VISTA OR WINDOWS® 7

On Vista and Windows® 7 systems, user account controls (UAC) have been responsible for various erratic HYPACK® issues. Some of these occur during installation. The UAC also interferes with time synchronization capabilities. For this reason, we recommened that you turn the user account control off.

To turn off the User Account Control :

1. **In the Windows® Control Panel, go into 'User Accounts and Family Control'**.
2. **Select 'User Accounts'**.
3. **Click on the option to 'Turn User Account Control on or off'**. A new dialog will appear.
4. **Clear the 'Use UAC to help protect your computer' checkbox**.
5. **Restart the computer** to put your change into effect.

WINDOWS® REGIONAL OPTIONS

There are varying conventions for numerical notation throughout the world. In the United States, we use a comma for digit grouping (ex. 12,345) while some of our users abroad use a period. Similarly, where in the States we use a period as the decimal symbol (56.13), some of our users use a comma.

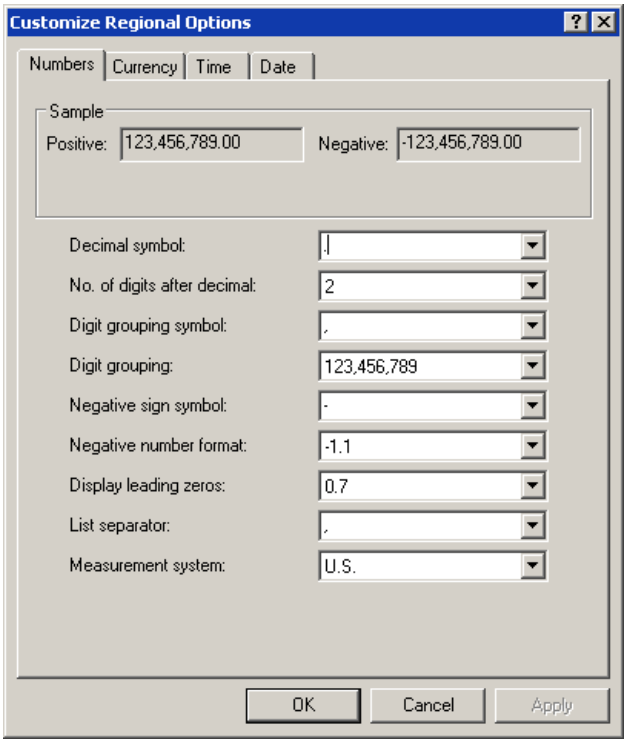
HYPACK® uses the American convention using a period for the decimal symbol and a comma for digit grouping. Problems arise if your Windows® settings for these otions are not set to use the same convention.

When you install HYPACK®, you may see a small warning that your settings are not compatible.

To change your conventons for numeric notation:

1. **Click the Windows® Start button-SETTINGS-CONTROL PANEL**.
2. **Select REGIONAL AND LANGUAGE OPTIONS**.
3. **In the General tab, click [Customize].** The Customize Regional Options dialog appears.

FIGURE 1-1. *Customizing your Numeric Notation Conventions*



4. **In the Numeric tab, set the Decimal Symbol to '.' and your Digital Grouping symbol to ','**.
5. **Click [OK]**.

WINDOWS® 7 DATA EXECUTION PREVENTION SETTINGS

Some of our users on Windows® 7 machines have had periodic exception errors when they tried to launch certain HYPACK® modules (Geodetic Parameters and Survey). The problem originated with the Windows® Data Execution Prevention (DEP) function. The solution: limit this function to Windows® programs and services.

To modify your DEP setting:

1. **In the Windows® Control Panel, open 'System and Security' and click the System link**.

2. **Click on the Advanced system settings link** in the naviation bar. The System Properties dialog will appear.
3. **In the Advanced tab, click [Settings].** The Performance Options dialog will appear.
4. **In the Data Execution Prevention tab, select 'Turn n DEP for essential Windows® programs and services only' and click [OK]**.
5. **Restart your computer** for these changes to take effect.

FIREWALLS

Your firewall settings can affect HYPACK® performance when you are working with network connections. As technology advances, HYPACK® uses network connections increasingly more often. These applications includesuch uses as:

- Network dongles
- Network connections in the hardware configuration
- Using the OPC server in dredge configurations

Any time you have network connections, the firewall can interfere with required HYPACK® function of these connections.

The solution: Take your computer off the internet and turn off your firewall.

DONGLES

A dongle is required by HYPACK® to activate the program modules associated with the license purchased. It is also encoded with permit numbers required to display S63 or ARCS electronic charts.

The **License Manager** runs the dongle test. The program reads your license information and displays your dongle status and permit numbers.

Beginning in 2009, HYPACK, Inc. began issuing a new, timed dongle. These keys have the following added functionality beyond the previously used hardlocks.

- **Programmable expiration date:** The keys will be burned with the your maintenance plan expiration date. After this date, the dongle will not allow you to run further program upgrades until your license is renewed. (Leased dongles will not allow you to run HYPACK® after the lease expiration.)

- **Allows renewal over the internet:** When your license is renewed, HYPACK, Inc. will email you a license file which is used to update your dongle information.
- **Allows multiple users to use one dongle on a local network.** One dongle on a specified computer in your office can be used for 'n' users (5, 10, 12, 25, etc.). The dongle automatically limits the number of users at any one time to the number of license purchased for this key.

All of these additional functions will also be managed through the License Manager.

IMPORTANT! Aladdin hardlocks will run HYPACK® only through version 2009A. If you want to run any subsequent releases, you must upgrade to the new dongle. The new dongles *will not work with HYPACK® versions earlier than 2009A*.

More Information:

- "License Types and their Programs" on page 10-58

LICENSE MANAGER

The LICENSE MANAGER reads your HYPACK® license information and displays your dongle status with the permit numbers required for S63 and ARCS charts.

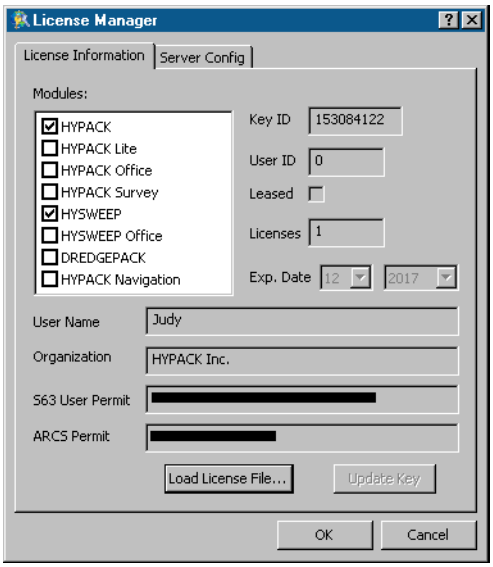
The LICENSE MANAGER can be run either from the HYPACK® interface or as a stand-alone executable.

To run the dongle test:

- **Through the HYPACK® interface**, select on SETTINGS-CHECK HARDLOCK.
- **As a stand-alone program**, from the Windows® Start menu, select PROGRAMS-HYPACK-LICENSE MANAGER.

The LICENSE MANAGER automatically reads your dongle and displays the information found there.

FIGURE 1-2. *LICENSE MANAGER*



The LICENSE MANAGER display includes the following:

- **All dongle types detected** will be checked under Modules. If it detects no key, it displays a dialog with direction to either attach your key and try again or define a new network location where your network key is found.
- **Key Number**
- **User Name, ID Number and Organization**
- **MP (Maintenance Plan) Ending:** Any program updates after this date will not run. You can arrange with our Accounting department (MP@hypack.com) to renew your Maintenance Plan over the internet.
- **Leased:** If this option is checked, the dongle will not be recognized by HYPACK® after the Expiration Date. This prevents leased keys from working beyond the contracted time.

NOTE All old-style keys will appear as leased with an expiration of December 2009. To upgrade to HYPACK® 2010, the old hardlocks should be converted to the new dongles.

- **Number of licenses enabled on the dongle.** If you are using it only for your computer, this number will be '1'. Numbers larger than one allow multiple users to use the dongle on a local network.
- **ARCS Permit Number** which is used in a routine to enable you to use ARCS background charts.
- **S63 User Permit Number** which is used in a routine to enable you to use S63 background charts

[Rescan] repeats the test.

More Information

- "Updating your License" on page 1-10
- "Network Dongles" on page 1-10
- "Loading ARCS Charts to HYPACK®" on page 2-5
- "Loading S63 Charts to the Project" on page 2-16

UPDATING YOUR LICENSE

When your maintenance plan or lease nears expiration, you must contact HYPACK, Inc. to arrange for renewal if you want to continue to receive program updates and new releases past your expiration date. When the proper arrangements have been made with our accounting department, we will email you a license file. (You may receive these burned to CD by special request.)

1. **Copy the license file to your hard drive.** The location on the hard drive is unimportant. (If you copy it from a CD, be sure the file on your hard drive is *not read only.*)
2. **Select SETTINGS-CHECK HARDLOCK** to access the License Manager.
3. **Click [Load License File].** A File Select dialog will appear
4. **Select your license file and click [Open]**. The new license information will display in the License Manager.
5. **Verify the new information is correct.** The MP Ending date should match your new Maintenance Plan Expiration date.

IMPORTANT! If, by chance, an error is made in generating your license file, you may not be able to run the modules for which you have purchased licenses.

6. **Click [Update Key].** This checks that the key number matches the license information, then updates the key to run HYPACK® according to your license.

NETWORK DONGLES

A network dongle is programmed to allow a pre-determined number of users to run HYPACK® on a local network.

For example, you have 5 HYPACK® Office licenses. You can install HYPACK® on 20 office computers and configure them to look for the dongle in a specified network location. Up to five users can log on simultaneously and run the package without having a dongle on their

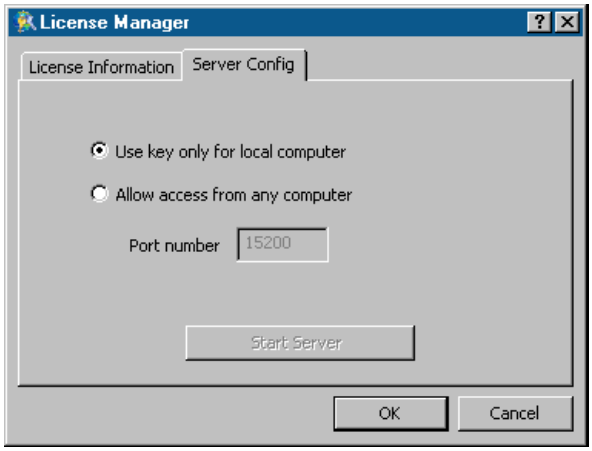
individual computer. If a 6th user tries to log on, they get a message telling them that all licenses are currently in use and to try again later. (You can, of course, contact us and make arrangements remotely change your license to a 6-user one, for the cost of the additional license.)

CONFIGURING A NETWORK DONGLE

To configure a network key on your server:

1. **Run the License Manager**.
2. **In the Server Config tab, select the 'Allow access from any computer' option, enter the port number of the computer with the dongle and click [Start Server].**

FIGURE 1-3. *Server Configuration Tab*

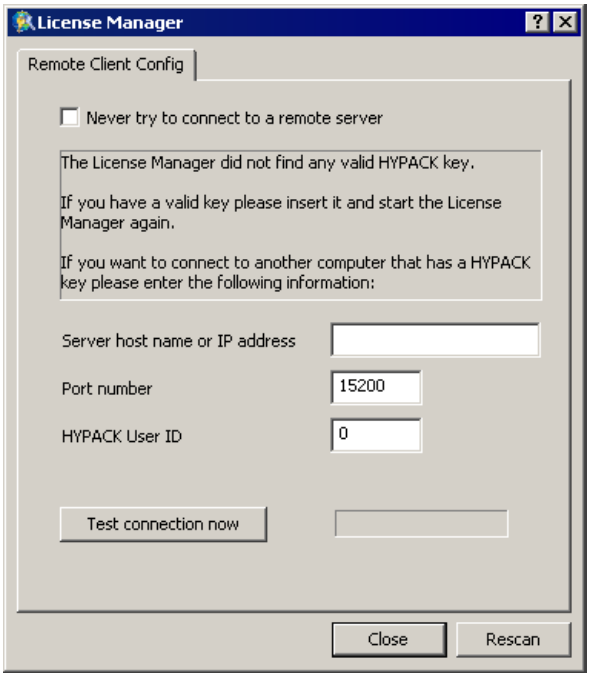


3. **Click [OK]**.

ACCESSING HYPACK® ON A NETWORK KEY

1. **From the Windows® Start menu, select PROGRAMS-HYPACK 2009-LICENSE MANAGER**. The License Manager appears and, since you have no dongle on your computer, it assumes you want to work on a network connection and provides the interface for you to configure the connection.

FIGURE 1-4. *Configuring Network Connections in the License Manager*



2. **Enter the name or address and the port number for the server** where the dongle is installed.
3. **Enter the HYPACK® User ID.** This is part of the display when you scan the key itself so you can get this from your network administrator. (It is also on record with HYPACK® Technical Support.)
4. **Click [Test connection now].**

USER PERMISSIONS

User Permissions can be configured to limit which modules are available to each person or group of people who use HYPACK®. User Permissions can *not* enable modules that are not supported by the type of license (hardlock) you have purchased.

When HYPACK® is launched for the first time after installation, there are no permissions set and no password is required to log on.

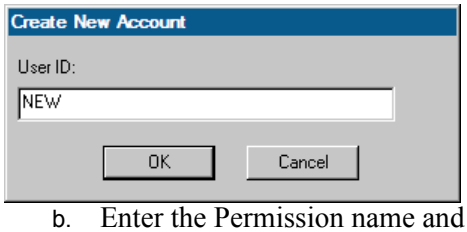
If you want to use the Permission feature, your designated System Administrator should:

1. **Open the Control Panel and click [Security Settings]** in the General Tab.
2. **Choose a password** by entering a password and clicking [Apply].

NOTE: By definition, the Administrator has access to all areas.

3. **For each additional user**, the Administrator will do the following:
   a. Click [Add]. The Create New Account dialog appears.

FIGURE 1-5. *Create New Account Dialog*



   b. Enter the Permission name and click [OK].
   c. Enter the password for that user. If no password will be required, leave the field blank.
   d. Select program areas where the user will be allowed to work.
   e. Click [Apply] and [OK].

The next time someone launches HYPACK®, the additional users will be listed in the Log On dialog. Each user can only launch HYPACK® by logging on with their user name and entering their associated password. Once in the HYPACK® interface, they can only access those areas designated for them.

The following example demonstrates how this might work:

Assume you have purchased a full HYPACK® license (all modules available). Your company surveys during the day, and office staff edits the data and create Final Products in the evening. As the System Administrator, you might create a set of User IDs and passwords that provide access only to the modules required for each group to their assigned tasks, while maintaining full access to all licensed modules for yourself. In this example, an additional 'Guest' option allows anyone to log in without a password, but they can only modify the main display. They have no access to program modules beyond the HYPACK® shell.

FIGURE 1-6. *Administrator— Full Access*

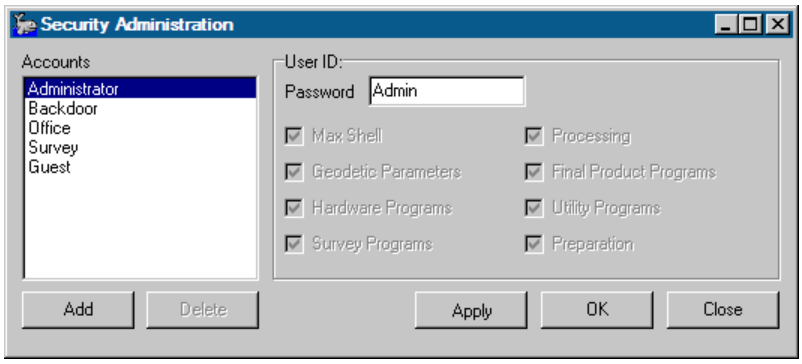


FIGURE 1-7. *Survey—Modules used on the water. Could omit Preparation option.*

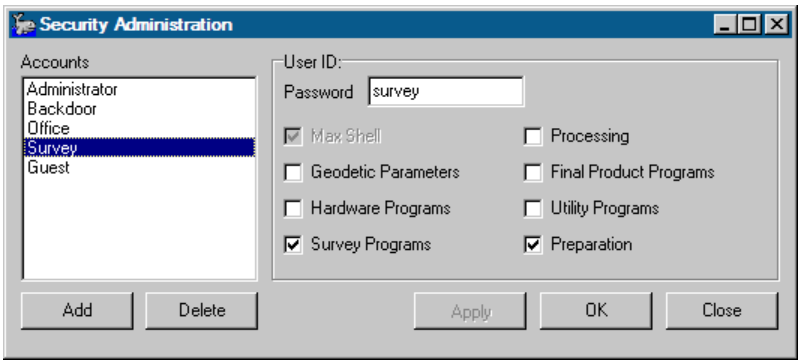


FIGURE 1-8. *Office—Modules used in post-processing.*

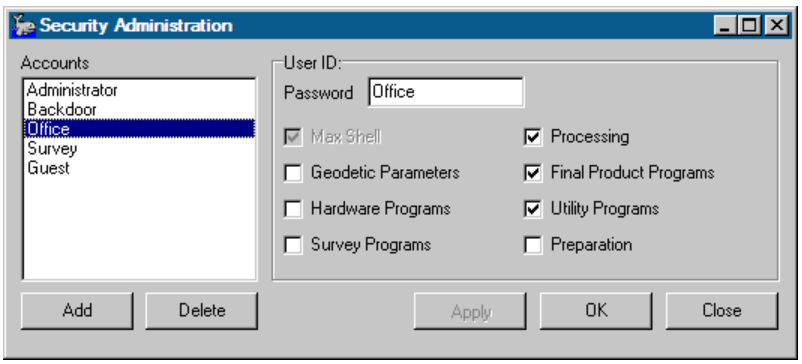
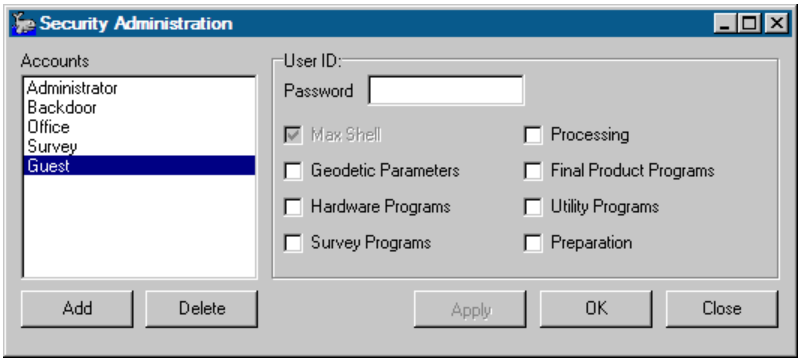


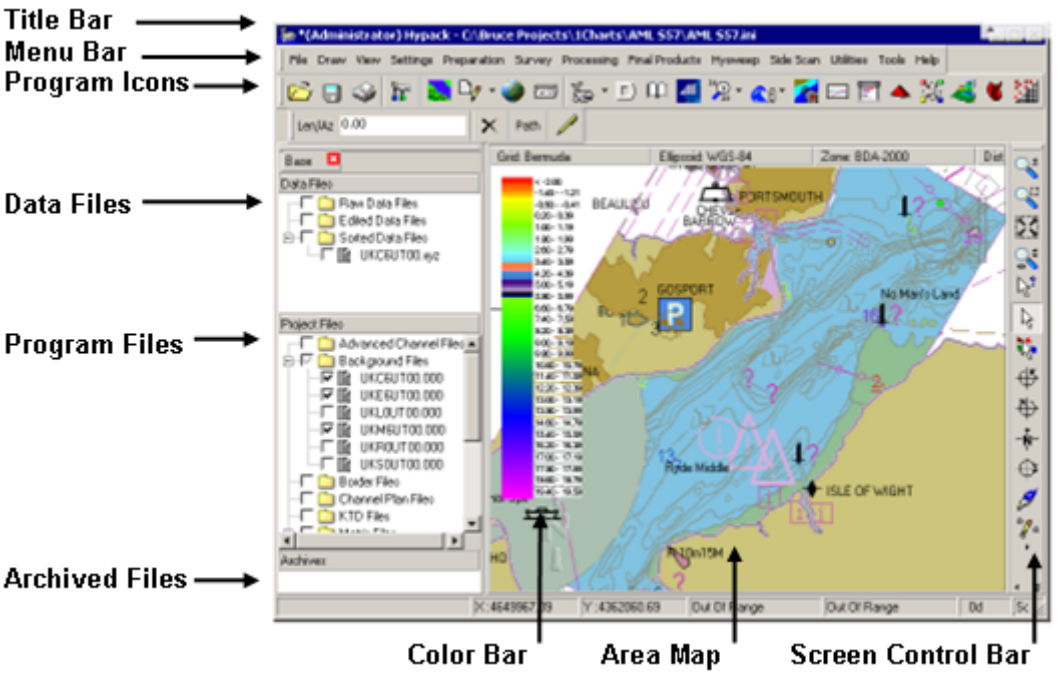
FIGURE 1-9. *Guest—Allows display only.No password required to log on.*



HYPACK® INTERFACE

The unified HYPACK® user interface displays the data and project files included in your project.

FIGURE 1-10. HYPACK® User Interface (Main Program)



All of the programs of HYPACK® can be accessed from the interface. Programs can be started from either the tool bar or from the menu bar. The icons and menu selections are enabled according to the type of license (dongle) you have.

More Information:

- "License Types and their Programs" on page 10-58

HYPACK® FILES LIST

Along the left-hand side of the user interface you will see a tree view listing of the files associated with each project. VIEW-FOLDERS toggles the display of project and data files tree view on and off.

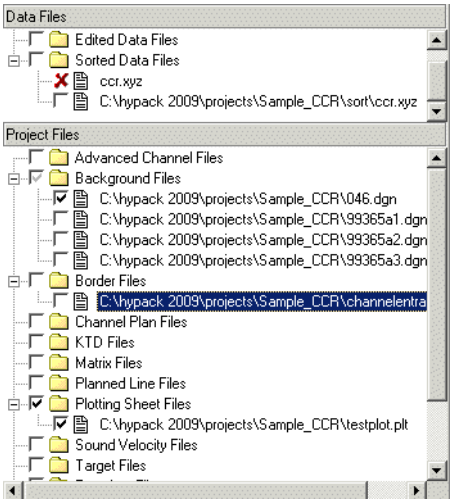
In the treeview, you can do any of the following:

- **Control which files are loaded to your project** and displayed in the area maps.
  - **Check box checked:** File is enabled in your project (drawn to the screen).
  - **Check box clear:** File is disabled.
  - **Red X's:** File is not available.
- **Open any file in NotePad** by right-clicking and selecting 'Open in Notepad'.

- **Open Windows Explorer to the folder where any file in your project is stored** by right-clicking and selecting ‘Open in Explorer’. Alternatively, open the project folder by selecting FILE-WINDOWS EXPLORER.
- **Collapse/expand the tree view** based on your needs by clicking the plus and minus signs on the left.
- **Include/exclude the full path name** for each file in the project by selecting DRAW-SHOW FILE LOCATION.

Widen the display area by dragging the right border horizontally across the screen.

FIGURE 1-11. *Full Paths Displayed in Tree View*



More Information

- “HYPACK® Data Files” on page 1-64
- “HYPACK® Project Files” on page 1-69
- “Data File Types” on page 10-1
- “Project File Types” on page 10-2

HYPACK® Tool Bars

HYPACK® includes many program modules to support the varying needs of our users and the changing technologies in the industry.

The menu and tool bars access the program modules and display controls. They are user-configurable by adding and removing commands from the default bars or by creating new bars altogether.

You can toggle the tool bar displays on and off through a right-click menu or drag the tool bars to whatever position you prefer--even outside of the HYPACK® window.

HYPACK® Menu Bar

The HYPACK® **menu bar** selections group all of the component programs into basic functional areas.

Tip: The editing programs may also be accessed by double-clicking the file you wish to edit in the Project Files list to the left. HYPACK® will open the appropriate editor for the file type and load the file into it. HYPACK® takes care to warn you of any unsaved data already in the editor and offers you the opportunity to save the data.

In addition, the File, View, Draw and Settings menu items provide tools with which you will manage your project and its display settings.

The menu bar is fixed at the top of the HYPACK® shell.

HYPACK® Icon Bar

The **icon bar** quickly launches a program with a click on its icon. As with all tool bars in HYPACK®, if you hover the cursor over an icon, a tool tip will appear which describes the function of the icon.

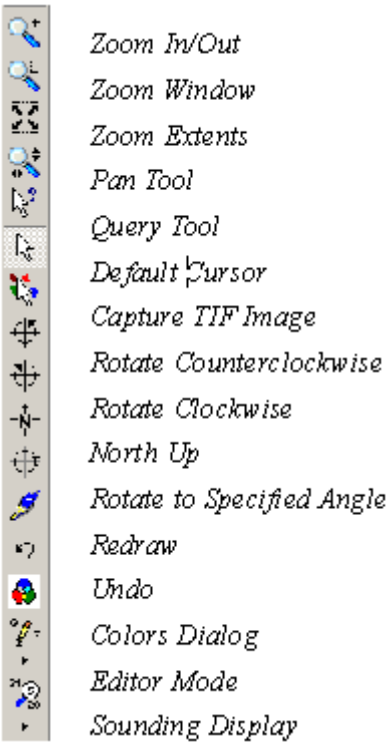
FIGURE 1-12. *HYPACK® Tool Bar*

To turn the icon bar display on/off, right-click in the tool bar area and select/deselect 'HYPACK® tool bar'.

HYPACK® Screen Control Bar

The screen control bar enables you to quickly adjust the HYPACK® screen display. Many of its functions are also found in the View menu.

FIGURE 1-13. *HYPACK® Screen Control Bar*



Zoom In/Out: When this option is selected, a left-click decreases the scale (zoom in) and a right-click increases the scale (zoom out).

Zoom Window: Select this option and drag a rectangle in the window to define the extent of your desired view. The program will redraw the screen to display the defined area optimally.

Zoom Extents: When this option is selected the screen will be drawn at a zoom scale that displays all enabled data.

Pan: Select this option, then click in the window at the point around which the display should be centered. The display will redraw accordingly.

Rotate Counter Clockwise and **Rotate Clockwise** rotate the chart 5 degrees.

Rotate to Northup sets the map to position north at the top of your screen.

Rotate to Degrees rotates the Map window counter-clockwise by a user-specified amount.

Redraw refreshes the map window display.

Undo reverses the last Zoom operation.

The **Colors** dialog enables you to specify colors for different sounding intervals. These settings are reflected in the color bar, which can be displayed in the HYPACK® interface by selecting VIEW-COLOR BAR.

Editor Mode: Some of the modules used to create and edit HYPACK® 'support files' (ex. border, matrix, target and plotting sheet editors) allow you to record data in the editor by clicking positions or manipulating file borders in the area map. During these processes, you may need to temporarily interrupt this type of work to adjust the map view which would require a different cursor tool. To resume recording information to the editor, you must select your editor from the drop-down associated with this icon.

The **Sounding Display** icon provides quick and easy access to the sounding style and color options from the Control Panel.

To turn the screen control bar display on/off, right-click in the tool bar area and select/deselect 'HYPACK Screen Control'.

More Information

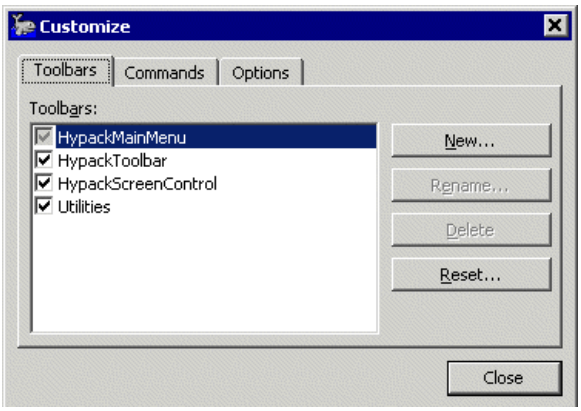
- "Querying Area Map Features" on page 1-43
- "Soundings Display Settings" on page 1-25

CONFIGURING THE HYPACK® TOOL BARS AND MENU BAR

The HYPACK® menu and tool bars are installed with a default set of items and icons. However, you can configure them with any number of programs and commands available according to your license (dongle) type.

1. **Right-click on any tool bar and select 'Customize'.** A tabbed dialog will appear.
2. In the Tool Bars tab, **select which tool bars to display**, generate new ones, rename existing bars or delete custom tool bars you no longer need.

FIGURE 1-14. *Tool Bars Tab*

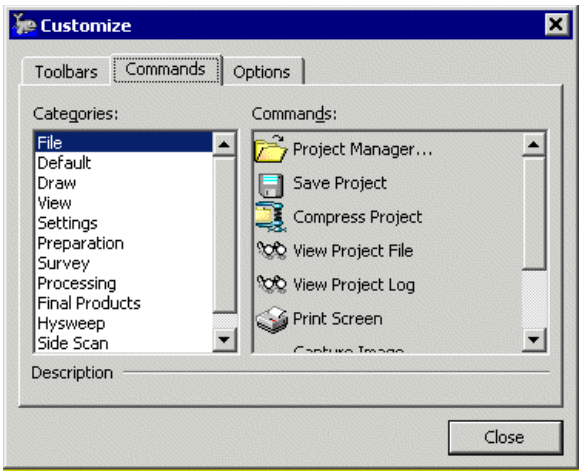


- **To select which tool bars display**, check the corresponding check box in the tool bars list.
- **To generate a new tool bar**, click [New] and name your tool bar in the dialog provided then use the Command tab to add the items you need.
- **To rename a tool bar**, select the tool bar in the list and click [Rename]. Enter the new name in the dialog provided and click [OK].
- **To delete a tool bar**, select the tool bar in the list and click [Delete]. You cannot delete the default tool bars.

3. In the Commands tab, **configure your menus and icons**.

   Each menu heading is listed on the left and the commands applicable to the selected heading are listed on the right.

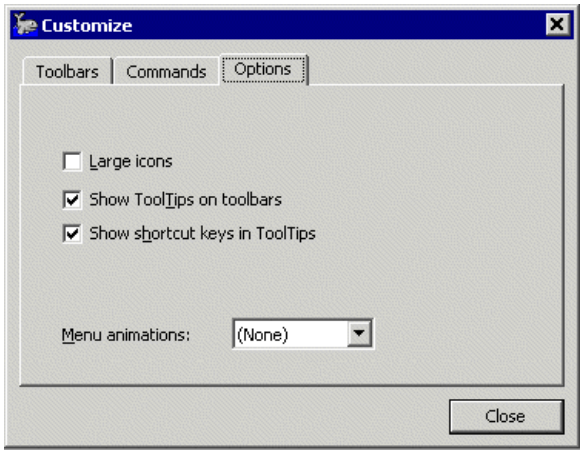
FIGURE 1-15. *Commands Tab*



- **Add icons or commands**.
  i. Select the menu where the required command is listed by default.
  ii. Drag the command from the list on the right to the desired menu bar or tool bar location.
- **Remove icons or commands** from the tool bars by dragging from the tool bar to the dialog.

4. In the Options tab, **set options for *how* your menus and tool bars display.**

FIGURE 1-16. Options Tab



Options include:

- Large Icons
- Tool Tips
- Keyboard Shortcuts
- Menu animations.

5. **Return to the HYPACK® screen** by clicking [Close].

USING THE MEASURING TOOL

You can use the default cursor to measure the distance and azimuth between points in the HYPACK® area map. When the default cursor is selected, the measuring tool will appear as a tool bar.

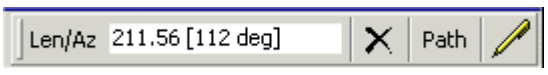
To measure the distance and azimuth between two points, just click and drag between the two points on the map. The measurements will appear in the measuring tool.

To measure the distance along a multi-segmented line:

1. Select [Path].
2. Click along the line you want to measure at the beginning, at each point where the line changes direction and at the end. At each click, the tool bar displays the total distance along line and the azimuth of the most recent segment.

NOTE The Line to Cursor icon, used together with the Path, displays the path between the previous point and your current cursor position.

FIGURE 1-17. Distance and Azimuth Tool Bar



To begin a new path, click the Clear icon. The Path button will remain depressed so you can begin another set of measurements.

HYPACK® Area Map

The area map displays your project and data files. It enables you to preview your map display as you prepare to begin a survey or dredge project, and to view the results of many of the files generated in post-processing.

The Information Bar displays the current cursor position in X,Y and Lat./Long. (Local Grid). It also indicates the degrees of rotation and scale of the area map display.

HYPACK® provides numerous tools and settings that enable you to optimize the display of enabled project and data files. These settings are configured in one or more locations in the HYPACK® interface.

- In the Control Panel
- In the Menus
- In the Screen Control Bar
- In the Files List
- In the Colors Dialog
- In Scheme Builder

More Information:

- "Display Settings in the HYPACK® Control Panel" on page 1-22
- "HYPACK® Menu Bar" on page 1-17
- "HYPACK® Screen Control Bar" on page 1-17
- "Sounding Color Settings in HYPACK®" on page 1-34
- "Area Map Views" on page 1-39
- "Setting Chart Transparency" on page 1-41
- "Setting Chart Display Order" on page 1-42
- "Display Schemes" on page 1-45

Display Settings in the HYPACK® Control Panel

Select SETTINGS-CONTROL PANEL (F9) to control the presentation in the area map.

Your control panel display settings are interactive with your schemes. When you make a change through the control panel, the change will also affect the current scheme. Likewise, changes in the scheme will affect your control panel settings.

There is an additional ‘twist’ to this interaction. When you change a setting in the control panel, the corresponding change is made to the current scheme, but you will not see that change until you have either left and re-entered HYPACK®, opened a different project with the same scheme, or loaded a different scheme then the original one again. Any of these actions causes HYPACK® to re-read the scheme record and modify the display accordingly.

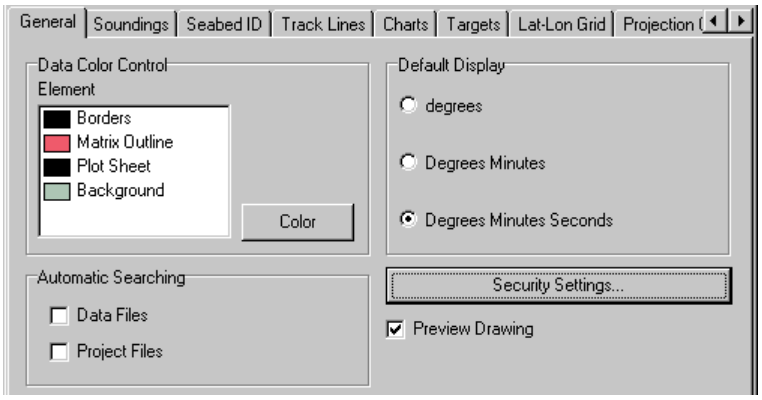
[Apply] enables you to preview your settings before exiting the Control Panel.

Set as Default saves the current settings and uses them any time you create a new project.

- “General Display Settings” on page 1-23
- “Grid Display Settings” on page 1-24
- “Soundings Display Settings” on page 1-25
- “Seabed Identification Settings” on page 1-28
- “Track Line Display Settings” on page 1-29
- “Planned Line Display Settings” on page 1-30
- “Chart Display Settings” on page 1-30
- “Target Display Settings” on page 1-33

General Display Settings

FIGURE 1-18. *Control Panel—General Tab*



The General Tab sets the display colors of several features.

Data Color Control enables you to select various file types and click [Color] to specify the color used on the screen.

Default Display determines the Lat/Lon format for data input and in the HYPACK® status bar.

Automatic Searching Options are used when you return to the main HYPACK® screen from one of the program modules.

- **Search Data Files** loads all Raw, Edited and Sorted data files that are not currently loaded to the HYPACK® display.
- **Search Project Files** tells HYPACK® load all project files in the project file to the HYPACK® display.

The default setting for these is "checked". If you have an excessive number of files in your project, you may want to manage the files loaded to your display manually. To do this, uncheck one or both of these then manually draw or remove them in the display as needed using the Load and Remove options in the right-click menu for each file type of the Data Files and Project Files lists.

[Security Settings] access the dialog where permissions and passwords are set.

Preview Drawing: Each time the HYPACK® window updates, it draws each enabled file to the screen as soon as it is available. If this option is cleared, HYPACK® will update the display only when all enabled files are ready to draw. This setting is strictly a matter of personal preference.

GRID DISPLAY SETTINGS

FIGURE 1-19. *The Projection Grid Tab*

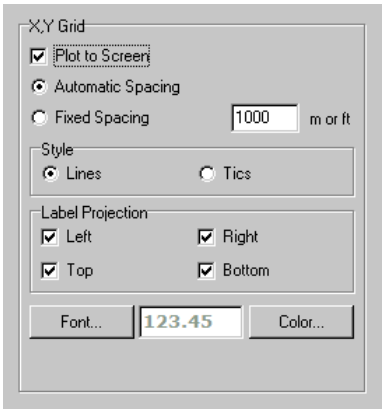
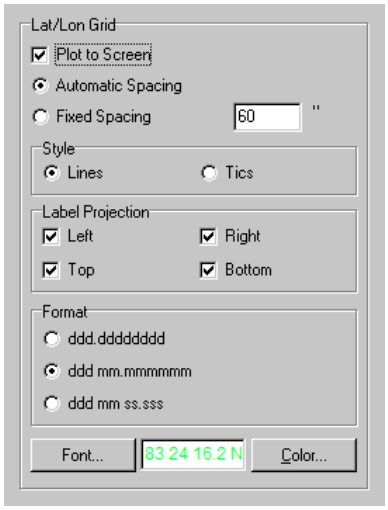


FIGURE 1-20. *Lat/Lon Grids Tab*



The Grid Tabs enable you to specify how projection grids and latitude-longitude (Lat- Lon) grids are displayed in HYPACK®.

NOTE: The Lat- Lon grid is displayed in WGS-84 in HYPACK® versions 5A and earlier. Later updates and versions display the Lat- Lon of the local datum.

Plot To Screen toggles the grid display on and off.

Automatic Spacing is the default setting to determine the spacing between projection grid lines. HYPACK® will automatically change the spacing as you zoom in/out.

Fixed Spacing specifies the meters (or feet) between projection grid lines and seconds of arc between Lat/Lon grid lines. This will be kept constant while you zoom in/out.

Style enables you to draw your projection grid using either Lines or Tics.

Label Projection enables you to assign which sides of the HYPACK® screen you wish to have the projection labels placed.

Font enables you to assign the font of the projection grid labels. Standard Windows® Color Selection and Font Selection Dialogs are presented for your choices.

NOTE Select only true type fonts to achieve the correct rotation.

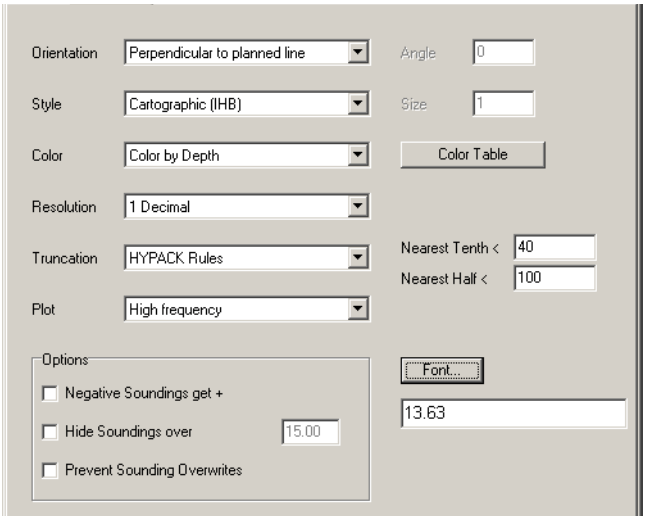
Color sets the color for your projection grid lines and labels.

The Latitude-Longitude Grid has an additional setting to those found under Projection Grid. **Format** enables you to specify how the Lat- Lon labels are written.

SOUNDINGS DISPLAY SETTINGS

The Soundings Tab enables you to set how the soundings are presented and plotted. You can toggle the display of the soundings by right-clicking the data file folder and selecting 'Enable Soundings'.

FIGURE 1-21. *The Soundings Tab*



Orientation draws XYZ data at a user-specified angle relative to the first LNW file listed in the project files list. Elect to plot soundings:

- **Perpendicular to the planned line**,
- **Parallel to the planned line**
- At a user-defined **Fixed Angle.** This is the angle the text is drawn relative to the map window. (It is unrelated to the map orientation.) Any angle from -360 to +360 is permissible

Style: Choose the format with which to write your sounding.

- **Decimal Point on the Mark (USACE)** option places the decimal point at the location of the sounding and writes a normal size fraction.
- **Cartographic (IHO)** centers the integer portion of the sounding at the sounding location and then writes a smaller, lower fraction.

- **Spanish Navy (IHM)** places the decimal point at the location of the sounding and then writes a smaller, lower fraction.
- **Pixel:** represent the location of each sounding with a color-coded Pixel (dot) of a user-defined size.
- **Russian:** The sounding location is marked with a dot with the sounding value from the TIN MODEL Input file to its right. If you have a second TIN model, the depth from the Additional file appears left of the sounding position.

Color is another place to define sounding color settings for loaded data files. You can draw soundings:

- **All in black** .
- **Color by Depth:** The accompanying button accesses the standard HYPACK® Color Settings dialog if you want to modify the depth colors.
- **ECDIS**
- **Color By File** allows you to set specific colors for each catalog or individual file.
- **Use Seabed ID:** If you load an XYZid file to TIN MODEL, where the 'id' is the seabed identification number, the program can output a matrix file based on the seabed ID instead of the depth. This enables you to display your data by seabed classification in the HYPACK® Map.

  These changes only affect this session of HYPLOT.

  When the Color by Depth option is selected, **[Color Table]** enables you to change the color palette for your soundings *without affecting your project colors*.

NOTE: The Sounding Display icon in the Screen Controls provides quick and easy access to the Sounding Style and Colors options in the Control Panel.

To display the matrix using your seabed ID colors:

a. From SEABED STATISTICS, **export your seabed ID colors to a HYPACK® Colors file** (*.HCF).
b. From the SEABED STATISTICS, **export the X,Y, Z, SeabedID** (*xyzid).
c. In TIN MODEL, **use your xyzid to build a TIN MODEL**. The matrix will automatically be filled with seabed ID information rather than depths.
d. **Export a matrix from TIN MODEL and display it in** HYPACK®.
e. **Use the Colors dialog to set the seabed HCF file** as your project colors.
f. **Check the 'Color By Seabed ID' option** in the Seabed tab of the Control Panel.

To manually assign colors to each file or to all of the files in the catalog:

a. **Right-click on the file or catalog** in the tree view.
b. **Select 'Choose Color' and select your color** from the color dialog.

   If you have right-clicked on a catalog, all files contained in the catalog will all be assigned the same color.

Resolution enables you to specify soundings to either one 1 Decimal (Tenths) resolution or 2 Decimal (Hundredths) resolution.

Truncation enables you to determine how the soundings are presented.

- **None** displays the soundings decimal places according to the resolution setting.
- **Truncate to Tenth** just leaves off the hundredth digit. For example, 6.97 is written as 6.9.
- **ROK Rules** and **HYPACK® Rules** use Republic of Korea and International Hydrographic Organization rounding rules respectively to present the soundings. If either of these last two options is selected, you must specify the depth level at which soundings are presented rounded to the nearest tenth and to the nearest half.

  For example, where Nearest Tenth=40 and Nearest Half=100, soundings below 40 meters are written to the tenth. Soundings from 40 to 100 are written to the half and soundings above 100 are written to the meter.

The **Options** settings contain the following items:

- **Negative Soundings get "+"** does just that. If you have processed your sounding data in elevation mode (z values are negative), this setting will display them on the screen in depth mode (z values are positive).
- **Hide Soundings Over** a user-defined level plots only soundings up to the specified depth.
- **Prevent Sounding Overwrites** plots soundings gridded with sufficient spacing to make them readable. To accomplish this, the number of soundings displayed in a given area changes with the zoom range. This is *for display purposes only. It does not thin your data*.

The **Plot Depth options** are used to tell the plotting program which depth to present**.**

- **Plot High Frequency** plots depth 1.
- **Plot Low Frequency** plots depth 2.
- **Plot Difference** plots Depth 2-Depth 1. This may provide a general idea of the thickness of bottom material.

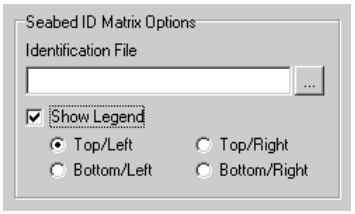
[Font] displays the Windows® font dialog for the sounding display.

More Information:

- "Sounding Color Settings in HYPACK®" on page 1-34

SEABED IDENTIFICATION SETTINGS

FIGURE 1-22. *The Seabed Identification Tab*



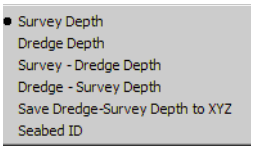
The **Seabed ID Matrix** options affect the colors used to display seabed–type matrix files in the HYPACK® window only. The matrix will display colors according to the seabed ID and the corresponding colors defined in the SIX file if you have:

- **Used TIN Model to create a Matrix file** with Seabed ID information, and
- **Selected Seabed ID** from the right-click menu of the Matrix folder in the Project Files List.

Click […] to select the Seabed Square File (*.SIX) which defines the project's seabed identification colors.

Note: In Seabed Identification matrix files, the survey depth is replaced by seabed ID information. If you select survey depth in the right-click menu, it is the same as selecting Seabed ID. Depth information can be viewed by selecting the Dredge Depth option.

FIGURE 1-23. *Seabed Identification Menu Options*



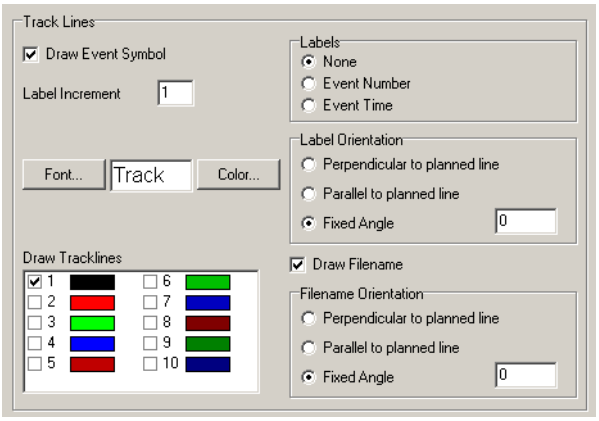
Show Legend displays a labeled color bar describing your seabed classifications. Select one of the options for its placement on the main screen.

FIGURE 1-24. *Sample Legend of Seabed Colors*

TRACK LINE DISPLAY SETTINGS

The Track Lines Tab affects the drawing and labeling of events and track lines. You can toggle the display of track lines to the screen by right-clicking the data file folder in the Data Files list and selecting *Enable Track Lines*.

FIGURE 1-25. *The Track Lines Tab*



Event Display Options:

Draw Event Symbol instructs the program to draw the event symbol at points where the SURVEY program generated event marks.

Label Increment defines how often the event marks will be labeled. An increment of 1 means every event mark is labeled. An increment of 5 means every 5th event mark is labeled.

Labels tells the program whether to label Events with Event Number or Event Time.

Label Orientation sets the angle at which event labels will be drawn. Elect to label events Perpendicular or Parallel to the planned line, or define another angle. **Fixed Angle** is the angle the text is drawn relative to the map window. (It is unrelated to the map and sounding orientations.)

[Font] is used to determine the font of the event labels.

[Color] is used to set the color of the event labels.

Track Line Display Options:

Draw File Name enables you to label the track lines with its file name.

File Name Orientation affects track line labels in the same manner as the Label Orientation affects the event labels.

Additional Track lines enables drawing the track lines of up to 7 vessels (positioning systems) to the screen. We all know that towfish don't follow the same track of the vessel towing it. Now you can see both track lines accurately displayed. Track line 1 will always belong to the vessel designated as the main vessel in SURVEY.

Planned Line Display Settings

The Planned Lines tab includes **checkboxes** where you can choose whether to display the lines and the labels.

Click **[Line Color]** to access a color dialog where you can choose the color that the planned lines will display.

The **Label Orientation** and **[Font]** options are the same a track line options.

Draw Template Points: If you have a planned line with template information, HYPACK® draws small circles at each template inflection point in the area map display.

FIGURE 1-26. *The Planned Lines Tab*

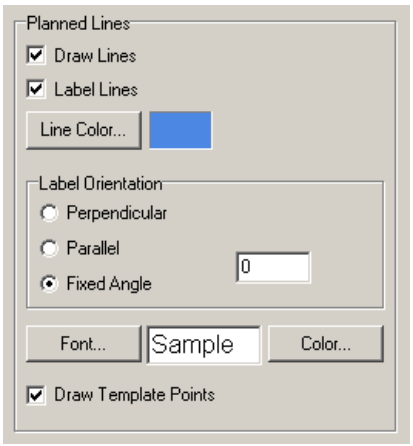
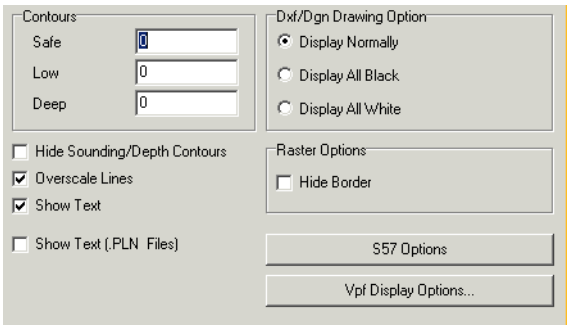


Chart Display Settings

The Charts Tab provides display options for background charts.

FIGURE 1-27. *The Charts Tab*



Contours:

Safe Contour works together with the **Hide Soundings/Depth Contours**. Soundings greater than the Safe Contour value will be displayed. In C-Maps, this also toggles the display of the contour shading.

Show Text includes item labels in the display. If you have several labeled items in a small area or if you are viewing a large area at a small zoom scale, the labels may become confusing. If this is the case, clear this option to display only the symbols.

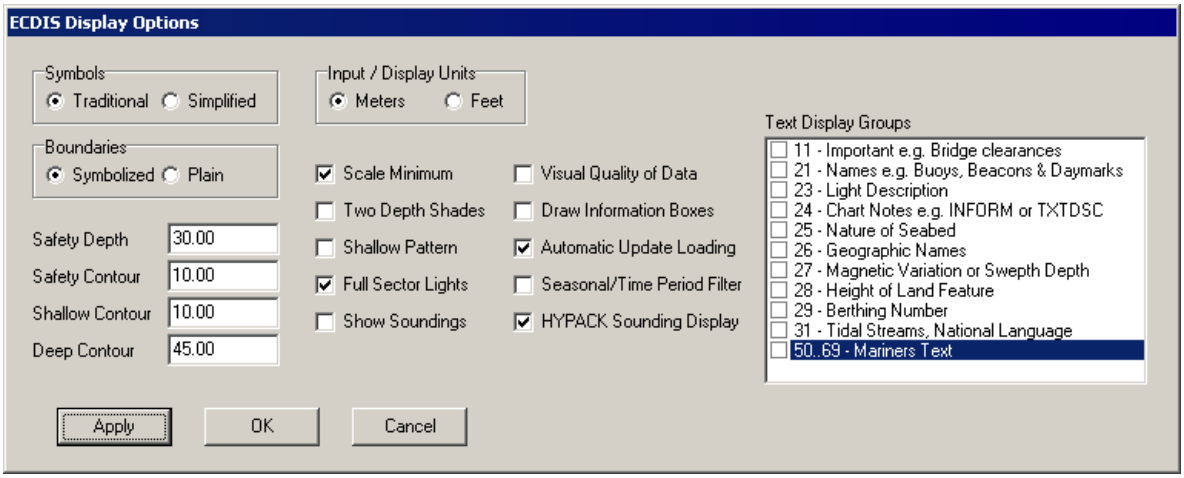
Raster Options: **Hide Border** displays only the map part of the chart file, omitting the text, scales and other 'extraneous' information around the outside.

C-Map Options: **Contours:** C-Map sets certain depth contour ranges in their charts. The water will be colored a darker shade to the upper limit of the range within which the Safe Contour value falls.

Over scale Lines tell you that you are viewing the chart at a smaller scale than that in which it was created. An over scale chart will appear with diagonal, white-dotted lines.

S57 Options: **[S57 Options]** in the displays the ECDIS Display Options dialog.

FIGURE 1-28. *S57 Options Dialog*



Symbols: Choose between Traditional and Simplified.

Boundaries: Choose to have them marked with symbols (Symbolized) or as plain lines (Plain).

Safety Depth displays depth labels in different colors above and below this depth.

Safety Contour, Shallow Contour and **Deep Contour** define different depth ranges which will be displayed with backgrounds of different shades of blue. Note: This option is overridden by the Two Depth Shades option.

Input/Display Units: The units of measure in which your depths will be displayed. It is also the unit in which you will work while in the ENC EDITOR. (You will enter chart soundings and all measurements in the selected units.)

NOTE: In the ENC EDITOR, sounding files imported to your chart are assumed to be in the units defined in your geodetic parameters. They are converted to the units indicated in your chart information and displayed according the units set in the S57 display options.

Scale Minimum displays different map features and symbols at varying zoom scales according to S57 standards. This option prevents your Map window from becoming overly cluttered. If this option is clear, everything will be displayed regardless of the zoom scale.

Two Depth Shades uses only two shades to display depths greater than and less than the Safety Contour.

Shallow Pattern draws a pattern in the areas of the map where the depth is shoaler than the safety contour.

Full Sector Lights includes data regarding direction and color of lights. If this is off, you will see only the position of the light source.

Show Soundings toggles the display of chart soundings.

Visual Quality of Data: S57 charts include markings that indicate whether the chart has been tested for accuracy and, if so, how accurate it is. Check this option to clear this 'clutter' from your display.

Draw Information Boxes: Draws S57 markers at all points of interest. Clearing this option will provide a less cluttered display.

Automatic Update Loading: When you load a base chart (typically *.000) and there are update charts (typically *.001, *.002…) in the same folder, checking this option loads all related chart information to provide the most updated display.

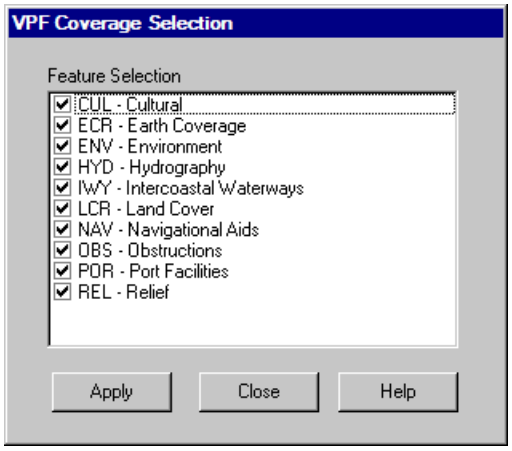
Seasonal/Time Period Filter: Object attributes may specify time ranges when they would be most applicable to display. Check this option to display only objects whose attributes match the current time.

HYPACK® Soundings Display: When 'Show Soundings' is checked, this option toggles between ECDIS display and HYPACK® display options.

Text Display Groups: Charts can get cluttered with excessive text. Select only those text features you want to see in your chart display.

VPF Display Options: Check the features listed in the Feature Selection you wish to have drawn and click [Apply] and [Close].

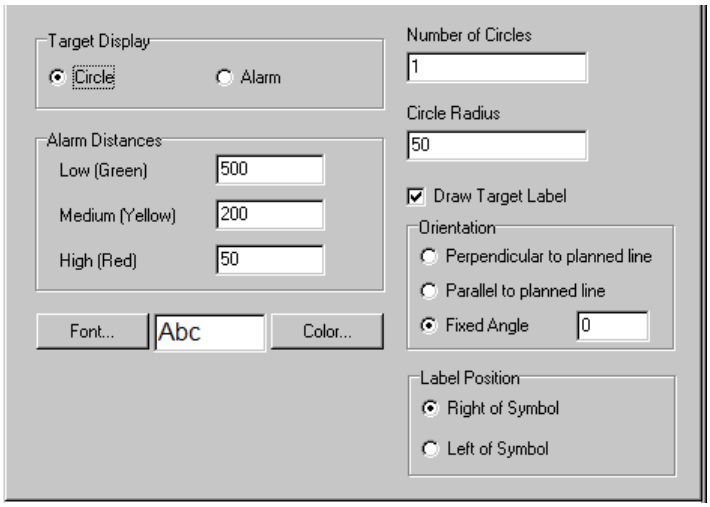
FIGURE 1-29. VPF Display Options



Raster Options: Hide Border allows you to draw ARCS and BSB charts without the border visible.

TARGET DISPLAY SETTINGS

FIGURE 1-30. Target Display Settings



The **Targets** tab of the Control Panel sets the target display in the HYPACK® main window. The SURVEY display settings are set independently.

Display Options:

- **Circle** displays a plain target. This option includes a user-defined number and size of circles to be drawn around the target.

  Draw Target Label toggles the display of the target name of circle and S57 targets on and off.

  Orientation sets the angle at which target labels will be drawn when the circle target display is selected. Elect to label targets **Perpendicular** or **Parallel** to the planned line, or define another angle. **Fixed Angle** is the angle the text is drawn relative to the map window. (It is unrelated to the map orientation.)

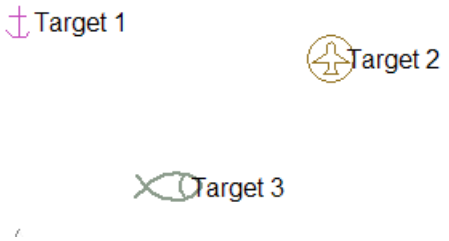
- **Alarm** includes a flag with the target name. Its background changes color according to the Alarm Distances settings. In SURVEY, alarm flags also display distance and bearing from the tracking point to the target.

  Alarm Distances: If you display the alarm flags, you can set them to change color according the distance between the targets and the boat origin. In the previous figure, the alarm flag will turn green when the vessel comes within 500 survey units of the target, yellow when it is within 200 units and red when it reaches 50 units from the target. These are the default colors and may be changed using the program.

  The **orientation** of the alarm flag is set in SURVEY through the Target Properties dialog or by entering the number of degrees rotated from north under 'Angle' in the TARGET EDITOR.
- **S57 Symbols** can also be displayed at target locations. The symbols are set in the TARGET EDITOR.

  To display S57 symbols, set the Number of Circles option to 0. Set the labels to display left or right of the target here in the Control Panel.

FIGURE 1-31. *Sample S57 Symbols at Target Locations*



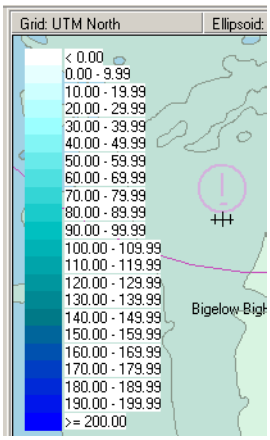
Target Label Color and Font can be set through a Windows® Font dialog. Just click […] and make your changes. The alarm flag will automatically resize to fit the label information. (If your labels are too large, try a smaller font.)

The **Label Position** options affect only targets displayed with S57 symbols. (The symbol is set in the TARGET EDITOR.) If you prefer to display no label, clear the **Draw Target Label** option, and set the **Number of Circles** option to '0'.

SOUNDING COLOR SETTINGS IN HYPACK®

The **Colors** dialog enables you to specify colors for different sounding intervals. These settings are reflected in the color bar, which can be displayed in the HYPACK® interface by selecting VIEW-COLOR BAR.

FIGURE 1-32. Sample Color Bar



- **To label all depth ranges,** right-click the color bar and select 'Show Text'. To include an opaque white background for the labels, right-click and select 'Opaque'. This option assures a clear view of your labels even with a detailed chart display.

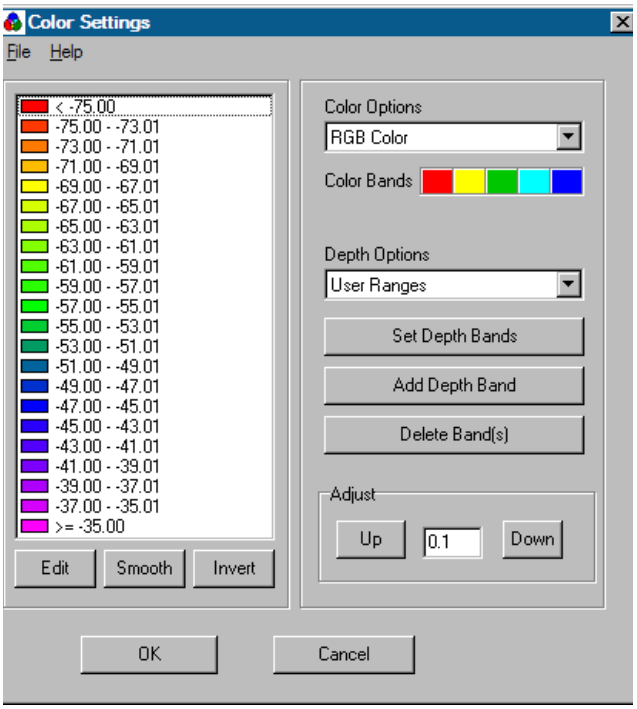
NOTE: The font of the color bar labels is determined in the active scheme. However, HYPACK® will display only as many labels as it can using the specified font and with no overlapping text.

- **To temporarily display an individual depth range**, hold the mouse over any color in the color bar and the depth range for that color will appear in the status bar.

To configure the color scheme for the soundings in your project, do the following:

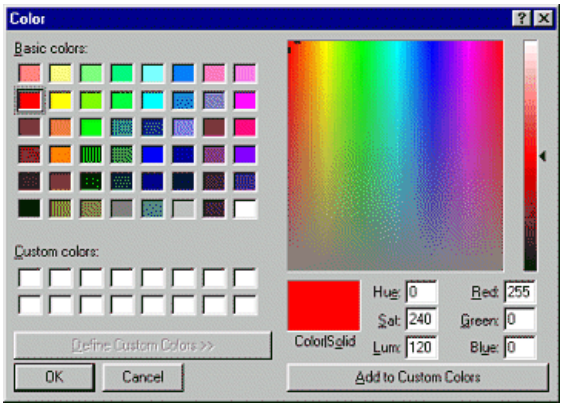
1. **Select SETTINGS-SOUNDING COLORS** or the Color Mode icon in the Screen Controls to display the Color Settings Dialog.

FIGURE 1-33. *Color Settings Dialog*



2. **Select your color options**.
   - **RGB Color** uses a rainbow spectrum, automatically distributing the colors over the specified depth range.

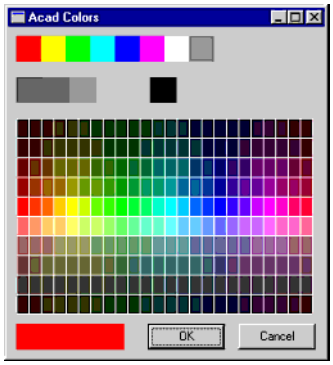
FIGURE 1-34. *RGB Colors Dialog*



   - **Edit the color for any step in the range** by selecting the step from the list at the left and clicking [Edit]. A color dialog appears to select a color for the selected step. You can interpolate through several steps by selecting them (they will be highlighted by a dark background) and clicking [Smooth].
   - **You can also edit a color band** by clicking on the band in the diagram to the right. The same color dialog will appear for you to choose a color. It will be inserted in the selected position and smoothed into the neighboring colors.

- **DXF Color** works in similar manner to RGB Color. Color selection is limited by the AutoCAD Color dialog and colors cannot be smoothed.

FIGURE 1-35. *DXF Color Dialog*

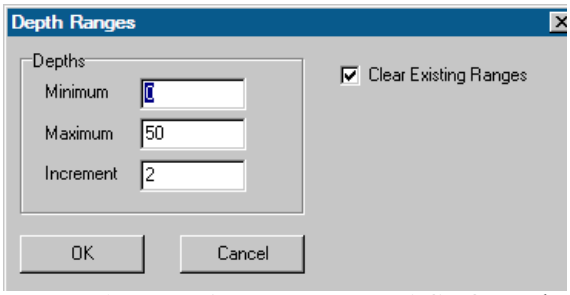


Note: If the number of bands exceeds 96, it will repeat colors in sequence again.

- **Light, Medium and Dark Spectra** automatically calculates a preset range of colors over the depth range. The individual depth colors cannot be edited, but the bands of colors that create the spectrum can be customized. Just click on the color you want to change in the color bands display and select your preferred color. The spectrum will automatically substitute your new color in the spectrum.
- **Relief** and **Chart** automatically calculate a preset range of colors over the depth range. The individual colors cannot be edited.
- **DXF Spectrum** distributes a DXF compliant rainbow spectrum over 18 bands (16 between the minimum and maximum depth and 1 at each end for depths outside of the defined range).
- **Side Scan Options:** There are several 'Sidescan X' options in the Color Options list are specifically designed to display side scan data. They automatically change the number of bands to range from 0 to 63 and apply color combinations that mimic the colors from the Colors tab in the Side Scan Controls dialog.

3. **Specify the depth range and increment for each color**.
   - **Manually:** Select the User Ranges depth option and click [Set Depth Bands]. Set the range with minimum depth, maximum depth and the depth increment in the dialog that appears. Click [OK] and the different zones will appear in the left-hand portion of the window with colors according to the selected color option.

FIGURE 1-36. *Depth Ranges Dialog*



- **Automatically:** Let HYPACK® set the range and distribute the colors accordingly by selecting the **Autoscale** depth option.

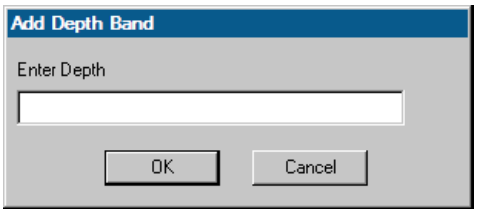
Note: You can fine tune the range to fit your soundings by shifting it up and down by a user-defined increment by using the Adjust feature. Enter the increment then click the [Up] and [Down] to shift the range. (The number of steps in the range remains constant.)

4. **Customize your ranges**. Once the initial set of ranges and colors is established, you can further customize your settings by adding and deleting bands.

To add a range:

a. **Click [Add Color Band]** and a dialog will appear.

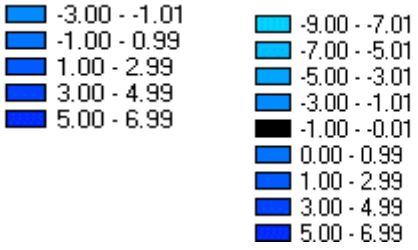
FIGURE 1-37. *Add Depth Band Dialoga*



b. **Enter a depth** *that does not currently define the lower end of a color range.* A new range will be added between the specified depth and the next shoaler depth.

For example, suppose you have the RGB spectrum pictured in the following Color dialog. Now you want to show a black contour line at the 0 level. Enter 0 in the Add Depth Band dialog and a new range will be added between 0 and -1, which is the next shoaler depth.

FIGURE 1-38. Adding a Depth Band at 0--Before (Left) and After (Right)



To delete a range:

a. **Select the color range** (you may select multiple contiguous ranges by holding the Shift key) you want to delete.

b. **Click [Delete Color Band]**.

- **If the selected range is at either end of the spectrum**, it will be omitted.
- **If the selected range is in the middle of the spectrum,** it will be merged with the next shoaler color range.

When you leave the Color Dialog, the set of ranges and colors is saved to the projects colors.hcf file for use:

- Each time you work in the project.
- As the default colors for any new project.

To save multiple color sets:

Select FILE-SAVE AS and name the HYPACK® Colors File. The settings will be saved to the HYPACK® directory with the HCF extension.

To select your custom color set, select FILE-OPEN and select the HCF file.

AREA MAP VIEWS

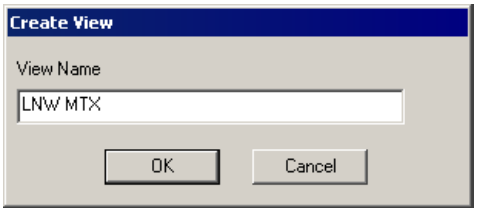
A '**View**' is a set of file enable, draw order and transparency settings combined with zoom and rotation settings. The combination is named and saved to the View for reuse.

You can configure and save multiple Views of your project and data files. This enables you to rapidly display various combinations of enabled data at different zooms and rotations, though you can display only one View at a time in the HYPACK® map.

To create a new View:

1. **Right-click in the area above the Data Files list and select 'Create View'**. The Create View dialog will appear.

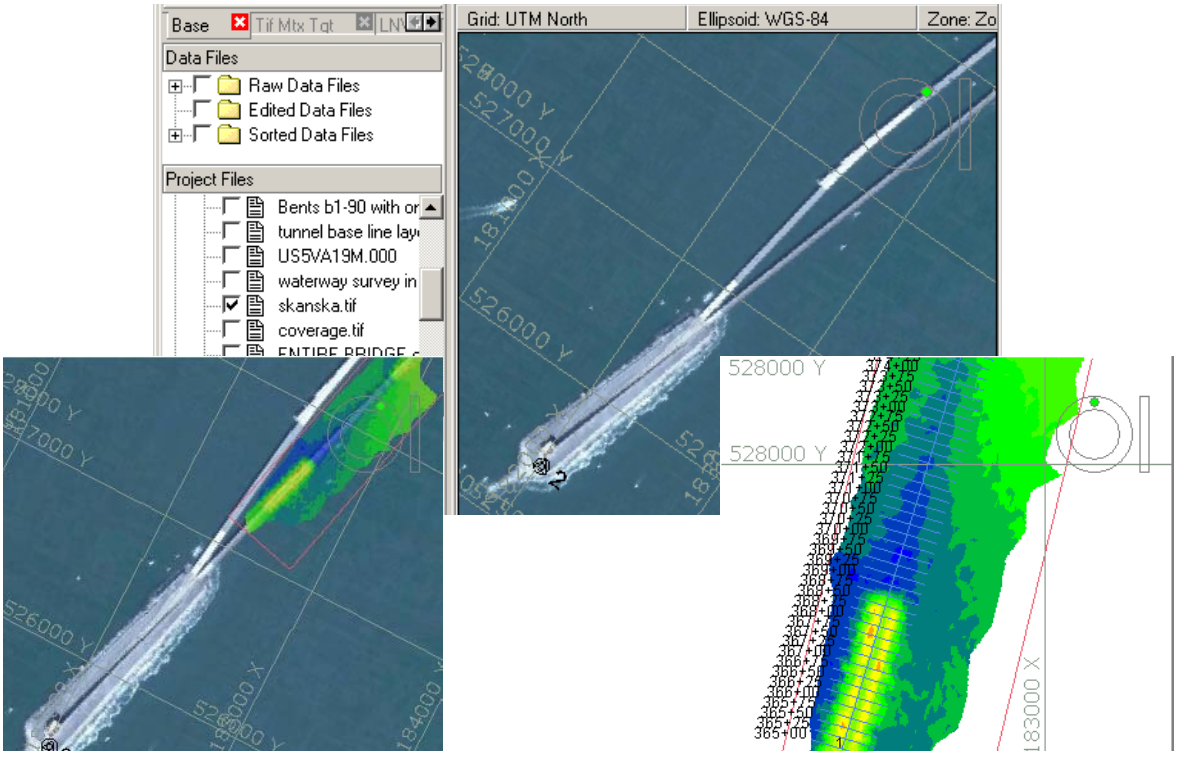
FIGURE 1-39. Create View Dialog



2. **Enter a name for your view and click [OK]**. For each View, a tab is generated above the Data Files list.
3. **Set the display options for your View**.
   - Enable the files you want to display in your View.
   - Set any applicable transparency settings.
   - Use the zoom, pan and rotation tools to optimize your display.

To restore a View: Click the corresponding View tab.

FIGURE 1-40. Sample Views



To rename a View:

1. Right-click on the View tab and select ‘Rename View’.
2. Enter the new name in the dialog and click [OK].

To delete a View: Click the ‘X’ on the View tab.

To adjust zoom and rotation:

The View menu options control the zoom and rotation of the area map. The screen control bar provides quick access to many of these same options.

Zoom In/Out: When this option is selected, a left-click decreases the scale (zoom in) and a right-click increases the scale (zoom out).

Zoom Window: Select this option and drag a rectangle in the window to define the extent of your desired view. The program will redraw the screen to display the defined area optimally.

Zoom Extents: When this option is selected the screen will be drawn at a zoom scale that displays all enabled data.

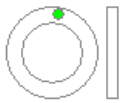
Pan: Select this option, then click in the window at the point around which the display should be centered. The display will redraw accordingly.

Rotate Counter Clockwise and **Rotate Clockwise** rotate the chart 5 degrees.

Rotate to Northup sets the map to position north at the top of your screen.

Rotate to Degrees rotates the Map window counter-clockwise by a user-specified amount.

The **graphical navigator**, in the area map, also provides zoom, pan and rotate functions.



- **To rotate the map**, drag your cursor around the outer ring.
- **To pan**, click inside the center circle. The location of your click inside the ring determines the direction the chart shifts.

To zoom in/out, click on the bar. Click near the top to zoom in and near the bottom to zoom out.

More Information:

- "HYPACK® Screen Control Bar" on page 1-17
- "Setting Chart Transparency" on page 1-41
- "Setting Chart Display Order" on page 1-42

SETTING CHART TRANSPARENCY

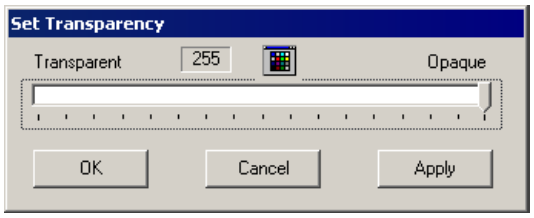
Background charts and matrix files are often solid areas of color. Even if they are not solid, they can obstruct your view of another file drawn beneath it.

Sometimes you can modify the draw order to place the 'solid' file below the file it is obstructing. However, if you have two solid files, changing the draw order will not help. In this case, you can set the transparency of the top file so you can see through it to the file below. Transparency only applies to charts and matrix files.

To set file transparency:

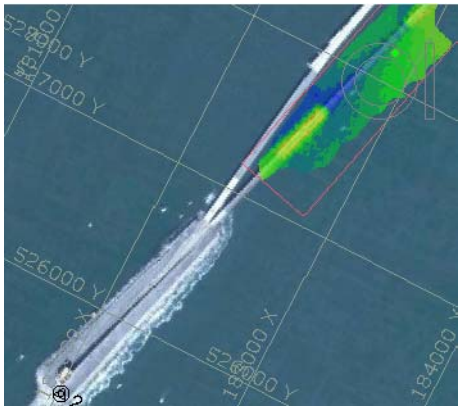
1. **Right-click on the file name in the Project Files list and select 'Transparency'**. The Transparency dialog will appear.

FIGURE 1-41. *Transparency Dialog*



2. **Use the slider to set the level of transparency**.
3. **Click [Apply]** to preview the results in the map. (Optional)
4. **When you are satisfied, click [OK].**

FIGURE 1-42. *File Transparency - The transparent matrix allows you to see the TIF chart beneat*



NOTE: The Transparency option is not available for ARCS, C-Map, S64, SHP or VPF charts..

SETTING CHART DISPLAY ORDER

All files are drawn in the default HYPACK® order which, in most cases, draws them in an order that prevents one file from hiding another in the display. You can, however, modify this option in your project.

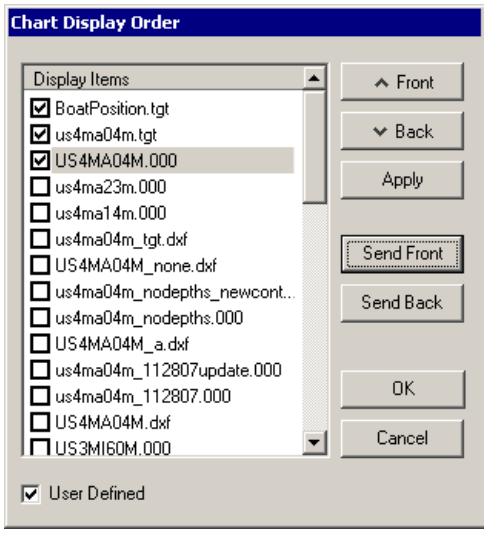
Bring to Front: You can quickly bring a file to display on top of all others through the right-click menu. Just right-click on the file you need to see and select 'Bring to Front'. The selected file will then be visible in the area map display.

Chart Display Order Dialog:

In the Chart Display Order dialog you have full control over the draw order of each element displayed in the area map:

1. **Right-click on the Background Files folder** in the Project Files list. A pop-up menu will appear.
2. **Select the Chart Display Order option.** A dialog will appear which lists all of the charts and other files available to be drawn to your map. Items that are checked are items that are currently enabled in your project. Items at the end of the list are drawn first and will be overlaid by any above them in the list that are selected.

FIGURE 1-43. *Chart Display Order Dialog*



3. **Check those items that you want to draw** in your HYPACK® display.
4. **Check the User-Defined option** at the bottom of the dialog.
5. **Order your charts**. You can click and drag the files in the list or select one and reposition it with the buttons:
   - **[Front]** and **[Back]** shift the selected file upward and down one position respectively.
   - **[Send to Front]** and **[Send to Back]** shifts the selected file to the beginning or end of the list respectively.
6. **Preview your results**. Click [Apply] and check the map.
7. **When you're satisfied, click [OK]**.

QUERYING AREA MAP FEATURES

The **Query Tool** displays attribute information about objects in S57charts, as well as about several types of HYPACK® files. When you click the Query Tool icon, the cursor changes to an Interrogate tool. It then displays the attribute information for any object within 2mm of where you click in the area map. All supported objects

within range of your query are listed on the left side of the window. Select the object on the left and the information appears on the right.

S57 Charts: Click on any feature in your chart, and the query window presents information about the chart itself, as well as the features at your click location. Some charts have purple information tags. Use the query tool to access the chart information embedded in the chart. Information will be in either text or *.TIF files, which must be in the same folder as the chart file.

FIGURE 1-44. *S57 Feature Information*

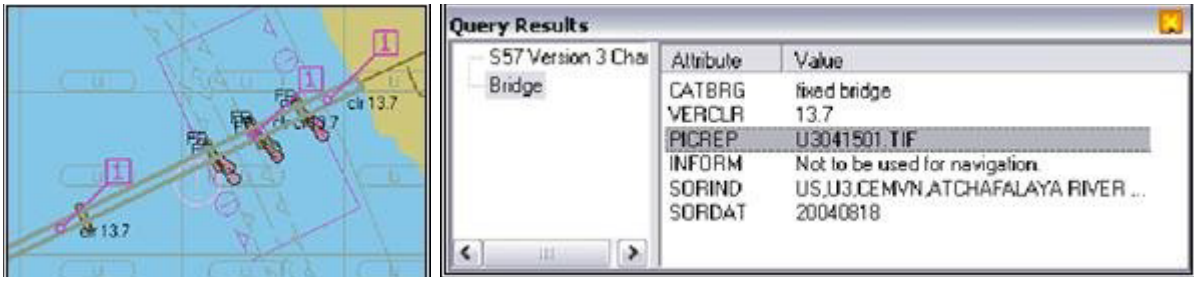
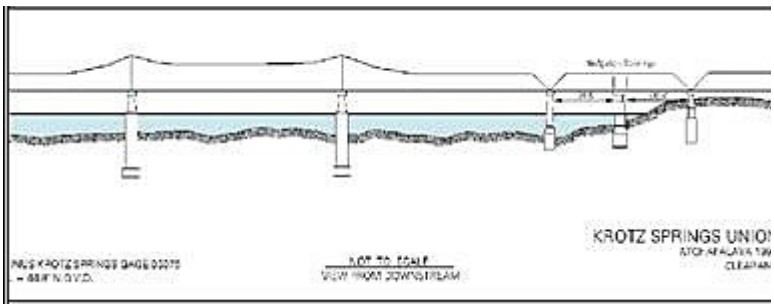
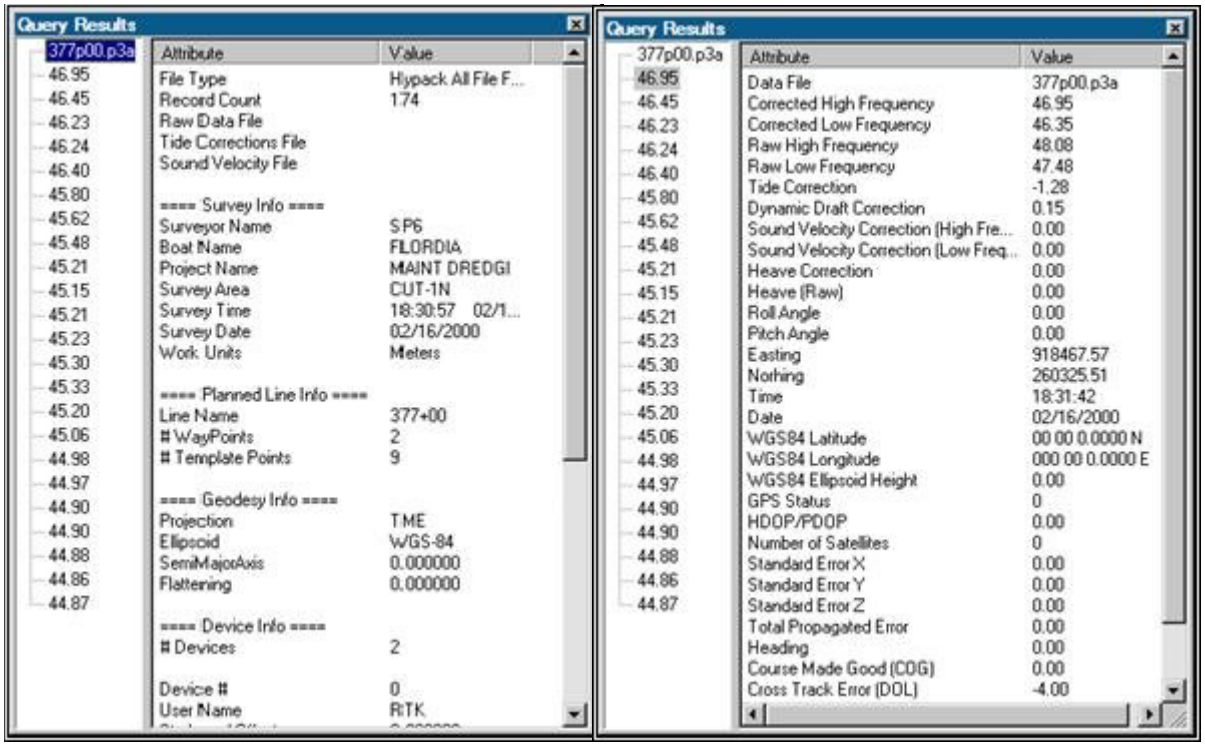


FIGURE 1-45. *Sample S57 Information in TIF format shows a profile view of the bridge queried in the chart.*



HYPACK® All Format Data Files: Click on a line of All Format data and the query window presents information about the survey and the individual soundings. Select on the line name in the Query window to see survey information, and geodesy and hardware settings. Select a sounding to see statistics about that sounding such as the raw and corrected values, all corrections and quality information.

FIGURE 1-46. *Results of All Format Query.*



DISPLAY SCHEMES

The SCHEME BUILDER program enables you to create total 'Schemes' which are customized color, font and line weight settings.

You can create different color combinations to suit changing lighting and weather conditions or the personal tastes of different helmsmen. Line weights and font sizes can be increased to make them more prominent in your display. You can change from one scheme to another as often as you like.

SURVEY supports multiple map windows. Using the window tabs in SCHEME BUILDER, you can even configure different schemes, one for each map window.

When you have completed choosing your settings, select FILE-SAVE to overwrite the current scheme settings or FILE -SAVE AS to create a new scheme, and name your file. The settings will be saved by default to the \HYPACK\Schemes directory with an SCX extension.

You can select the desired color scheme in either HYPACK® (select SETTINGS-COLOR SCHEME) or SURVEY (select OPTIONS-COLOR SCHEME).

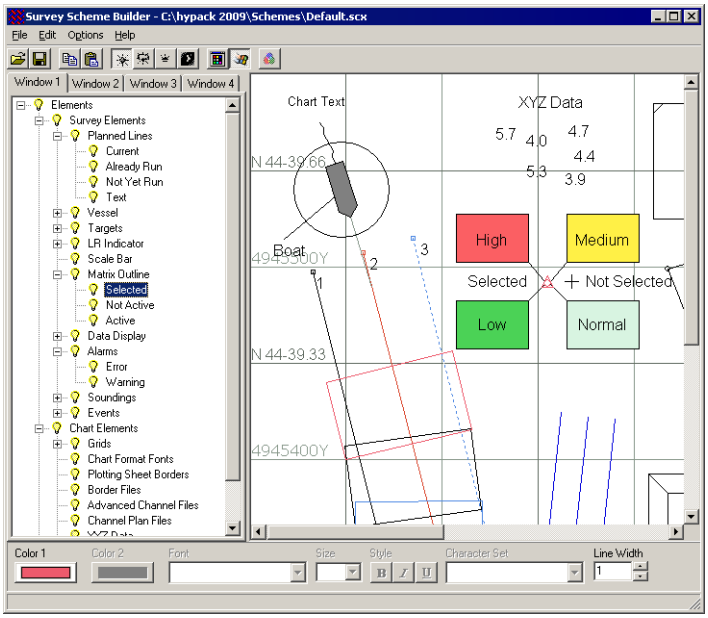
NOTE: Schemes are interactive with your Control Panel display settings. If you have a scheme loaded, then make a change through the Control Panel, the change will also affect the scheme. Likewise,

changes in the scheme will affect your Control Panel settings. There is an additional 'twist' to this interaction. When you change a setting in the Control Panel, the corresponding change is made to the current scheme, but you will not see that change until you have either left and re-entered HYPACK®, opened a different project with the same scheme, or loaded a different scheme then the original one again. Any of these actions causes HYPACK® to re-read the scheme record and modify the display accordingly.

CREATING DISPLAY SCHEMES IN SCHEME BUILDER

1. **Launch SCHEME BUILDER** from the HYPACK® menu by selecting SETTINGS-SCHEME BUILDER. The SCHEME BUILDER dialog will appear.

FIGURE 1-47. *Scheme Builder*



The expandable tree view on the left lists all of the features that can be customized in SCHEME BUILDER. The display on the right shows how each feature will be displayed with the current scheme settings.

2. **Select a window tab.**
3. **Select an object** by clicking it in either the tree view or in the display on the right.
   - **If you select the feature in tree view**, a rectangle around the corresponding feature in the sample display on the right will flash several times to show you which object in the display you have selected.
   - **If you select the feature in the display**, the tree view selection will automatically synchronize to your selection.
4. **Define the settings for each feature.** In most cases, this is just choosing the color, line weight and label font. Other features have specialized settings.

- The **color buttons** will display the current color setting for the selected object.
- **If you have selected a text item**, the controls for font, size and style will become enabled for your use.
- **If you have selected a line item**, the control for line width will become enabled.
- **If you have selected the sample S57 chart,** set the ECDIS day/night color settings using one of the Day/Night icons on the tool bar.

5. **When you have completed all of your settings, save your scheme.** FILE-SAVE will save the settings to the current scheme (overwriting the previous settings). FILE-SAVE AS enables you to save your settings under a different scheme name. In either case, your settings will be saved to the \Hypack\ Schemes directory with a *.SCX extension.

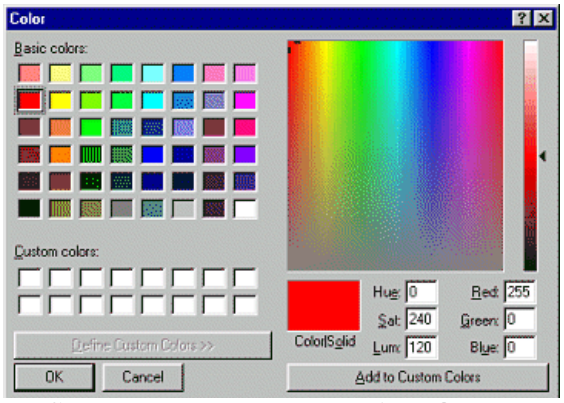
   Name your schemes something that will remind you for what conditions or for whom they were created. For example, you could name them "Bright Day" or "Dark Night" according to the environmental conditions for which they were created. If you have users with different personal preferences, each person can create their own schemes and name them, for example, "Night Al" or "Day Jordan". This saves time searching through your schemes for the one you want.

COLOR SETTINGS IN SCHEME BUILDER

To change the color of a feature:

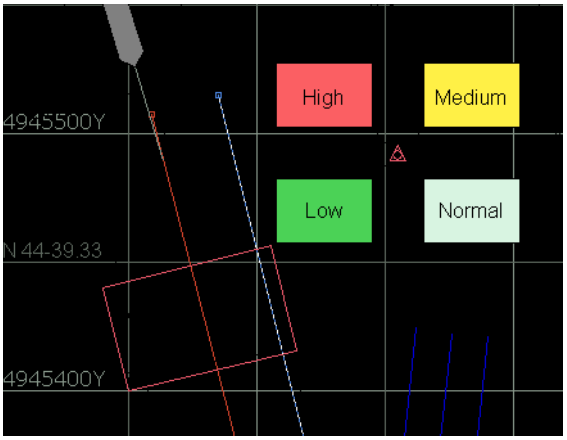
1. **Right-click the feature in the tree-view list.** The color buttons will display the current settings for the selected feature, and a popup menu will appear.
2. **Select the color to edit** and the colors dialog appears.

FIGURE 1-48. *Colors Dialog*



3. **Select the new color and click [OK].** You will see the results in the display at the right. If you don't like them, try again.

FIGURE 1-49. *Background Color Change*



You can quickly make multiple features all the same color. Just select the color for the first feature as normal then click the *Copy Color 1* icon. For the rest of the features, just select the feature and click the *Paste Color 1* icon. (You can use the traditional Edit menu options or Windows® keyboard shortcuts instead of the icons to cut and paste in the same procedure.)

Matrix Sounding Colors in Scheme Builder

The matrix sounding colors affect the color coding when SURVEY paints the matrix. (There is a separate Soundings setting for textual sounding displays in SURVEY.) These settings default to the HYPACK® sounding colors set in the HYPACK® control panel but you can choose to set an alternate color scheme as part of your scheme that will be used in SURVEY whenever the scheme is loaded.

1. **Click the Matrix Colors icon**. A Color Bar will appear next to the tree view with the project colors displayed and an additional colors icon will appear on the tool bar.

2. **Click the additional colors icon** to access the standard HYPACK® Colors dialog where you can set the matrix sounding colors for the scheme.

More Information

- "Sounding Color Settings in HYPACK®" on page 1-34

Text Settings in Scheme Builder

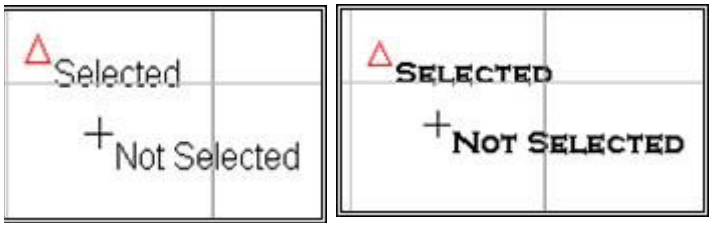
To change text appearance:

1. **Select the text item in the tree view list.** The Font, Size and Style controls will be enabled.

FIGURE 1-50. *Text Controls*

2. **Choose the font and size** from the drop-down menus and select the style by clicking the icon.

FIGURE 1-51. Sample Font Change



WINDOW SETTINGS IN SCHEME BUILDER

Settings for the window features are controlled in much the same way as the other features. However, there are a few differences.

You can use the icons on the tool bar (or the OPTIONS-WINDOWS COLORS choices) to choose between the Scheme settings defined in the tree view, and the default Windows® settings. Choose either set of settings for the windows and save it with the scheme.

You will notice that, as you edit the window settings, your changes are not immediately visible in SCHEME BUILDER. To see the effects of your work, select FILE-TEST WINDOWS COLORS. The default Windows® display settings are stored to a temporary memory while you are in SCHEME BUILDER so you can easily return to the Windows® settings by selecting FILE-RESTORE COLORS.

NOTE Testing the Windows® colors implements the scheme in all programs. *Restore them before exiting SCHEME BUILDER* or you will have to reset them through the Windows® settings.

LANGUAGE SELECTION

HYPACK® is available in multiple languages. If you want to use HYPACK® using a language other than English, you must load the languages during installation. HYPACK® will then default to the language set in Windows® if it is available. If the Windows® language is not available, HYPACK® will default to English.

You may change the language designation by selecting your preference from the SETTINGS-LANGUAGE menu. To set your choice as the default, you must then exit and re-launch HYPACK®.

The language of each program module will default to the HYPACK® language if it is available. Otherwise, it will be displayed in English. You may change the language of any module individually through the language menu. That change will remain effective until you exit the module.

PROJECTS IN HYPACK®

Every time you begin a new survey in HYPACK®, you will create a new "project". A project contains all of the information about your survey. Each time you create a new project, HYPACK® creates a folder using the project name. Project names may not contain periods, back or forward slashes, question marks, less than or greater than signs, or bars.

TABLE 1-2. *Invalid characters*

/	\	<	>	|

The project is saved by default, to the \Hypack_2011\Projects directory, but projects can be created anywhere on your network.

To verify the project path, check the path in the HYPACK® title bar.

To access the project folder, select FILE-WINDOWS EXPLORER.

To easily access any project file, right-click on it in the Project Files or Data Files list and select 'Open in Explorer'.

When you click [New Project], HYPACK® creates the project in the directory currently displayed in the Project Manager as in the following Richmond example.

TABLE 1-3. *Project File Paths*

Project	Project Directory
98105 Abu Dhabi	\Hypack_2011\Projects\98105 Abu Dhabi
Oct 99 North Balt Harbor	\Hypack_2011\Projects\Oct 99 North Balt Harbor
Richmond 1998 Pre-dredge	\ProjectStorage\Richmond 1998 Pre-dredge

Under the *ProjectName* directory, HYPACK® creates "\Raw", "\Edit", "\Sort" "\Archive", "Backup" and "\Core" sub-directories.

All new projects are created using the standard project settings:

- All of the project files will be saved to the project directory.
- The data files will be saved to the subdirectory appropriate to their type.

NOTE: If you are in doubt about the location of any file used in your project, select DRAW-FULL PATHS IN TREE to include each file's path in the Data Files and Project Files lists in the main HYPACK® window.

More Information

- "Creating a New Project" on page 1-53
- "Opening an Existing Project" on page 1-54
- "Copying an Existing Project" on page 1-54
- "Creating Duplicate Projects across the Network" on page 1-55
- "Saving your Project" on page 1-56
- "Hiding and Restoring your Project" on page 1-56
- "Compressing your Project" on page 1-57
- "Project Log" on page 1-58

MANAGING PROJECTS

When HYPACK® starts for the very first time, is begins with a set of default settings, but there will be no project open. That's because you haven't created one yet so, of course, your first step is to create a project. Once you have done that, HYPACK® will automatically open to the last project you worked on before exiting the previous session.

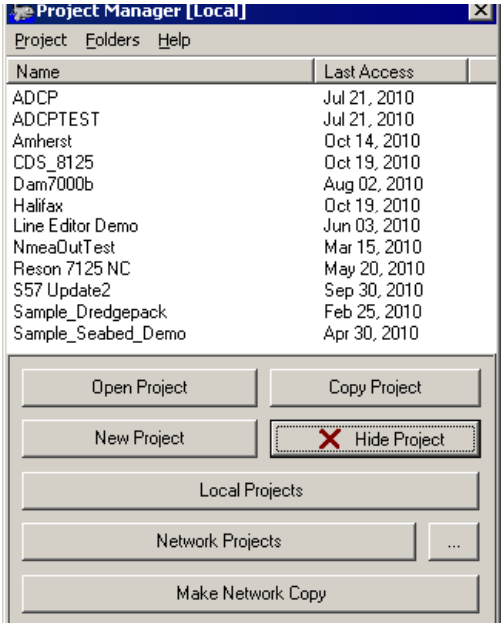
Over time, as you survey different areas at different times, you will create and work on several projects. To do that, you will change from one project to another according to the set of data on which you are working on any given day.

As part of the HYPACK® network capabilities, you may also want to copy projects to and from network locations, or work on data located somewhere other than the default \Hypack_2011\Projects directory.

Of course, over time, if you kept every project you ever recorded, the long project lists would become unnecessarily awkward, so you hide them in the project list.

All of these tasks are done through the Project Manager, which is accessed by selecting FILE-PROJECT MANAGER.

FIGURE 1-52. *Project Manager*



Unless you are creating a new project, the first step is to direct HYPACK® to the project with which you want to work. The Project Manager lists the projects in the folder where you last opened a project and, for each project, the date on which data was last modified.

If the project you want is in that directory, it will appear in the project list in the Project Manager.

If the project you want is in a different directory, you must first direct HYPACK® to the correct location.

- **[View Local Projects]** lists all projects stored in your \Hypack_2011\Projects directory.
- **[View Network Projects]** lists all projects in the last network location from which you opened a project.
- **[…]** calls a Browse For dialog which enables you to direct HYPACK® to look in another location on the network and list all project files there.
- **The Folders menu** lists the last ten folders where you have browsed for projects through the Project Manager. Quickly return to any of those folders by selecting it in the menu.
- **The Project menu** lists the last ten projects where you have worked. Quickly return to any of those projects by selecting it in the menu

Once the project is located, all you have to do is select it and click the button appropriate to the action you want to take.

- New Project
- Open Project
- Copy Project
- Hide Project

The project log records all of your activities from the time you log into the project until you log out. The data is stored in the project log.

- "Creating a New Project" on page 1-53
- "Opening an Existing Project" on page 1-54
- "Copying an Existing Project" on page 1-54
- "Creating Duplicate Projects across the Network" on page 1-55
- "Saving your Project" on page 1-56
- "Hiding and Restoring your Project" on page 1-56
- "Compressing your Project" on page 1-57
- "Project Log" on page 1-58

CREATING A NEW PROJECT

Use the Project Manager to create a new "Project".

1. **Select the location where your new project should reside** (the Projects folder in your HYPACK® install location in a standard project).
2. **Click [New Project]** and the New Project dialog will appear
3. **Name your new project and click [OK]**.

When you create a new project, the following actions take place:

- **Geodesy:** The geodetic parameters from your last project are copied into the new project.
- **Boat Hardware:** The hardware configuration from your last project is copied into the new project.
- **Survey Parameters:** All of the settings from the SURVEY program (Window layout, navigation parameters, alarm settings, etc.) are copied to the new project. This means the SURVEY program will have the same look and feel as in the last survey project.
- **Planned Lines:** There are no planned lines in a new project. You will have to make them or copy them from an existing project. If you are copying planned lines from another project, it will be easier to create the new project using [Copy Project].
- **Background Files:** There are no background files in a new project. You will need to select them by right-clicking on "Background Files" in the Project Files list and select "Add File" or "Add File and Copy".
- **Data Files:** There are no data files in a new project. You have to go surveying to get some raw data files.
- **Display Settings** use the default display settings set from the Control Panel.

NOTE If this is your very first project, you must set your Geodesy, Hardware and Survey settings as well, unless you are working in Halifax, Nova Scotia. HYPACK® includes a sample project with

the installation and will default to those settings if no other projects have been created.

Opening an Existing Project

1. **Open the Project Manager** by selecting FILE-PROJECT MANAGER. The Project Manager dialog will appear with a list of available projects, with the date each was last modified, in the directory where HYPACK® last accessed a file. That directory path will be displayed in the dialog's title bar.
2. **Direct** HYPACK® **to the correct directory**, if necessary.
3. **Select the project and click [Open Project]**.

HYPACK® restores the screen, geodesy, colors and other settings as when you last saved the selected project. The project path and name will appear in the HYPACK® Title Bar.

As long as you comply with the network system requirements files can be read and written, across the network. Projects can be accessed simultaneously across the network by anyone (with proper network permission). This means that one user can be creating reports from one day's data while another can be editing the next day's data.

Beware!

Beware! Take care that files within a project that are likely to be changed are accessed by only one user at a time. There is potential for one user over-writing the other's work. ("He who saves last wins!")

Beware!

Beware! The HYPACK® network capabilities were originally developed for use in the office. While preliminary testing shows that it is possible to log survey data across the network, *we recommend that you only log data to the same computer that is running SURVEY.*

More Information

- “Network System Requirements” on page 1-3

Copying an Existing Project

If you are going to survey an area you have already surveyed before (for example, running a post-dredge survey where you have already performed the pre-dredge), you should create a new project by copying the existing project.

1. **Open the Project Manager** by selecting FILE-PROJECT MANAGER. The Project Manager dialog will appear with a list of available projects, with the date each was last modified, in the directory where HYPACK® last accessed a file. That directory path will be displayed in the dialog's title bar.
2. **Direct** HYPACK® **to the correct directory**, if necessary.
3. **Select the project and click [Copy Project]**.

4. **Name your new project** and it will be created in the same directory.

When you copy a project, the following actions take place:

- **Geodesy:** The geodesy from the original project is copied to the new project.
- **Boat Hardware:** The hardware configuration from the original project is copied to the new project.
- **Survey Parameters:** The survey parameters used in the original project are copied to the new project.
- **Planned Lines:** The planned line (*.LNW) file from the original project is copied to the new project.
- **Background Files:** Charts residing in the original project folder are copied to the new project. Charts residing outside the project folder are displayed in the new project while remaining in their current location.
- **Data Files:** No data files are copied to the new project.
- **Other Files:** All of the other file types (Channel, Matrix, Plotting Sheet, Target, etc.) contained in the original project are copied to the new project, with the exception of Tide Files.
- **Display Settings:** The copied project will have the same display settings as the current project.

All files in the selected project folder are copied to the new project maintaining their enabled or disabled state. Files referenced in the project that are *outside* of the project folder *will not be copied*.

NOTE This is different from creating a duplicate project across the network.

CREATING DUPLICATE PROJECTS ACROSS THE NETWORK

With the advent of HYPACK® on the network, additional capability has been added to create a duplicate copy of a network project to your local Projects directory or vice versa.

This gives you the same result as using Windows® Explorer to copy the project folder across the network, then opening the project in your local Hypack_2011\Projects directory. The result is two identical, but *independently functioning* projects, with the same name but different locations.

- **[Make Local Copy]** (located in the Project Manager when viewing network projects) copies a network project to your local Hypack_2011\Project directory and adds it to your list of local projects in the Project Manager.
- **[Make Network Copy]** (in the same location when you view local projects) copies a local project to the last specified network directory and adds it to the list of projects in that location.

Beware!

BEWARE! *Be careful how you use this feature!* The potential for overwriting work is real. We recommend designating one location for project storage, then working on projects over the network, if possible.

SAVING YOUR PROJECT

PROJECT-SAVE PROJECT saves all of the settings and files used in the current project. When you re-open a project, it will restore all features as they were when you last saved the project.

HIDING AND RESTORING YOUR PROJECT

If you kept every project you ever recorded, the long project lists would become unnecessarily awkward, so you hide them in the project list.

Hiding Projects

[Hide Project] appends "(deleted)" to the project name and removes the project from the list in the Project Manager. *It does not delete the project or any files within the project.*

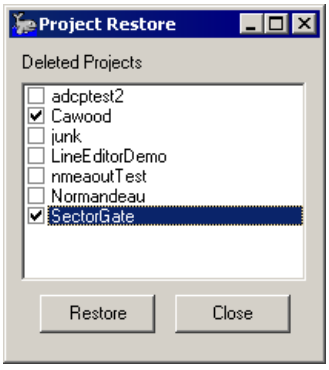
NOTE: HYPACK® does not allow you, or anyone accessing your computer across the network through HYPACK®, to delete projects from your hard drive. If you want to do so, you must do it manually using Windows® Explorer.

Restoring Projects

To restore a project to list in the Project Manager:

1. **Select FILE-RESTORE DELETED PROJECTS** and a Project Restore dialog will appear with a list of hidden projects in the current folder.

FIGURE 1-53. *Sample Project Restore Dialog*



2. **Check the project or projects that you want to restore and click [Restore]**.

This simply reverses the effects of [Hide Project].

COMPRESSING YOUR PROJECT

There are several options for moving your data files from one computer to another. These include:

- Logging directly to a removable hard drive.
- Copying the files using standard Windows® tools.
- Copying the files using the HYPACK® Program Manager.
- Compressing files and copying to disk using Zip compression software.

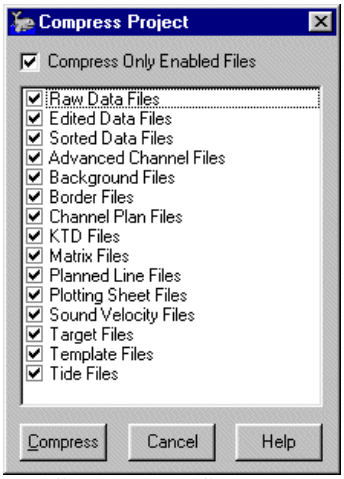
NOTE: We do *not* recommend logging across the network.

Use the HYPACK® Compress Project program to compress selected files to a self-executing zip file and copy to a disk.

The COMPRESS PROJECT program lets you choose the file types you want to include and compresses them to a self-extracting Zip file. If your file is large, COMPRESS PROJECT can save the data over several disks.

1. **Start the COMPRESS PROJECT program** by selecting PROJECT-COMPRESS PROJECT. The COMPRESS PROJECT window will appear.

FIGURE 1-54. *The COMPRESS PROJECT Window*



2. **Select your files you want to include** by checking the boxes corresponding to the listed items.
3. **Elect whether to compress all files of the selected types or only those that are enabled.** The default setting is to Compress Only Enabled Files.
4. **Click [Compress]** to begin the compression process. You will be asked to name your file then the data will be compressed and saved to a self-extracting Zip File.

PROJECT LOG

Each time a user works in a project, the activity is recorded to a text file known as the **Project Log** (*ProjectName.*txt) along with the date, time and User Identification. This record is stored in the project folder for use as a reference or to reconstruct a sequence of events that have led to the data results in your project. You can view this log by selecting FILE-PROJECT LOG.

TABLE 1-4. *Sample Project File:*

```
H:\Projects\MB\Hysweep_Survey_Simulation\realtime.mtx
Survey               Oct.21.2006 10:15:33  Administrator        SurveyEnded
HYPACK               Oct.21.2006 10:23:25  Administrator
<Started:sbMax>
HYPACK               Oct.21.2006 10:23:42  Administrator
<Started:MBMax>
HYPACK               Oct.21.2006 11:41:35  Administrator
<Started:swpWare>
Hypack               Oct.21.2006 12:01:30  Administrator         <LogOff>
```

MANAGING FILES IN YOUR PROJECT

Several types of files may comprise your project data. These files are listed in the Data Files and Project Files lists. HYPACK® provides a number of tools with which you control the files used in your project at any one time.

Loading: You must load files that you want to use in your project, but do not yet appear in your files list. The process tells HYPACK® the name of the file and where it is stored on your system.

Enabling and Disabling: Generally, enabled files are drawn to your map window. By enabling and disabling select files, you control the combination of files displayed in the map window at any one time.

Removing files unloads them from your project, but *does not* remove them from your hard drive. If you change your mind, you can reload them to you project.

Deleting files unloads them from your project and *permanently deletes them from your hard drive*.

Archiving files: The Archiving process compresses files and stores them in a separate folder within your project. This process is intended to help keep your project from being cluttered with files you are no longer using, but want to keep together with the project.

About Loading Files to your Project

Files that you create while working in a project will be saved by default to the project directory, enabled (drawn) on the screen, and added to the Project Files or Data Files list at the left.

Most files are loaded to the project through either of two simple methods.

Method 1:

1. **Right-click the file of the type you want to load** in the Project Files list.
2. **Select "Add File" or "Add File & Copy"**.
3. **Choose the file** and the file will be drawn to the screen and enabled in the Data Files or Project Files list at the left.
   - **If a file is in the project folder on your hard drive**, select "Add File". A file selection dialog will appear for you to select the file from your project file. The file will be drawn to the screen, but will not be copied into your project.
   - **Import a file** by right-clicking on the folder in the Files List and selecting "Add & Copy File". A file selection dialog will appear allowing you select a file from outside the project folder. Select the correct file, and the file will be copied to the project file and drawn to the screen.

Method 2:

1. **Use Windows® Explorer to find and select your files**.
2. **Drag the selected files to the HYPACK® Map window**. The selected files will be added to your project and enabled. *They will not be copied to the project folder* on your hard drive.

NOTE The Add File option is useful if you are using very large files (eg. charts) that takes excessive space on your hard drive in multiple projects.

BEWARE! Saving the project file will not save a file that has not been copied into the project file. The file must remain where it is on your system when you only add it to the project so HYPACK® can find it when you open the project.

NOTE Certain chart types require special procedures before you can load them.

HYPACK® attempts to draw your data in an order which will optimize the display of all enabled files. Occasionally, modifications to the draw order or transparency are required.

More Information

- "Setting Chart Transparency" on page 1-41
- "Setting Chart Display Order" on page 1-42
- "Loading ARCS Charts to HYPACK®" on page 2-5
- "Loading BSB Version 4 Charts to the Project" on page 2-8
- "Loading C-Maps to the Project" on page 2-9
- "Loading VPF Charts to the Project" on page 2-14
- "Loading S63 Charts to the Project" on page 2-16

ENABLING AND DISABLING FILES

Files listed in your Data Files and Project Files lists are only drawn to the screen if they are 'enabled'. Enabled files have checks in their corresponding checkbox.

Enable individual files by checking its checkbox in the Data Files or Project Files list.

Enable all files of one type by checking the checkbox for the file type in the Project or Data Files list.

'**Disabling' your files** keeps the file in your project file list, but omits it from the area map.

- **Erase all except the sounding files** in the current project by selecting DRAW-DISABLE PROJECT FILES. They are not deleted, just omitted from the screen view. This includes all of your planned lines, background files, etc.
- **Erase just the data files** in the current project by selecting DRAW-DISABLE DATA FILES. They are not deleted, just omitted from the screen view.
- **Erase one type of Project File** (ex. matrix files, target files, etc) by clearing the checkbox associated with the file type folder in the Project Files list..
- **Erase individual files** by clearing its checkbox..

UNLOADING FILES FROM YOUR PROJECT

- **'Remove' files** from the Project Files list and the area map.
- **'Remove' individual files** by right-clicking on the file in the File List and selecting 'Remove File'.
- **'Remove' currently unavailable files** by selecting DRAW-REMOVE MISSING FILES and whether you want to do this for data files only, project files only or for all file types

- **'Remove' all of one file type** by right-clicking on the file type folder and selecting REMOVE FOLDER FILES.

NOTE Neither disabling nor removing will delete the file from your hard drive! You can re-enable your file or reload the file to your project.

Delete any file *from your hard drive* by right-clicking on the file and selecting 'Delete File'. You will be asked to confirm your deletion.

A deleted file can not be restored!

ARCHIVING FILES

Some projects generate large amounts of data on a daily basis. Others are used repeatedly over extended periods resulting in large amounts of accumulated data. When large amounts of data accumulate, it can clutter your project and slow your work.

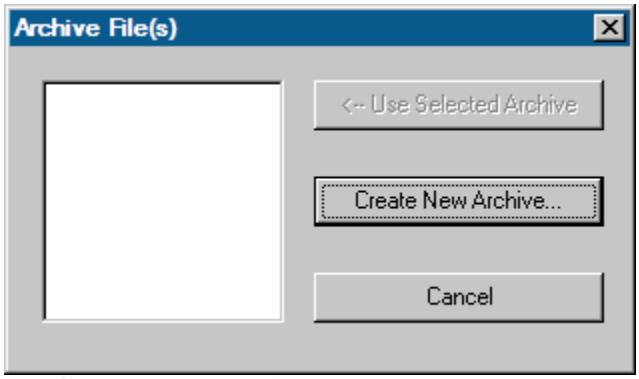
To solve this problem, you can archive selected files from your *local* project folder into compressed ZIP files which are then stored in an 'Archive' sub-folder within your project directory.

You can archive any type of file in your project. If you select a LOG file, the catalog and its member data files will be archived.

To archive files:

1. **Right-click on the file you want to archive**. The Archive dialog will appear. Any existing ZIP files in your archive folder will be listed on the left..

FIGURE 1-55. *Archive Files Dialog*



2. **Choose your archive**. You can:
   - **Create a new ZIP file** by clicking [Create New Archive] and naming your zip file. HYPACK® will suggest a default file name—"*Date FileName.*ZIP". You can choose a new name if you wish. Click [OK] to create the archive.
   - **Add to an existing ZIP file** by selecting the archive from the list then clicking [Use Selected Archive].

When the file is archived it is listed in the Archived Files list in your HYPACK® window.

Beware!

BEWARE!Take care about archiving files that may be contained in more than one LOG file. If you archive a file contained in more than one catalog, it will be unavailable to any catalogs of which it is a member in your Data Files list.

To restore your archived files to the original project folders:

1. **Check the file names you intend to restore against those in the folder to which you intend to restore them**.
2. **Right-click on them in the Archived Files list and select 'Restore'** from the pop-up menu.

   BEWARE!*This overwrites files of the same name!*

Beware!

NOTE There is a separate archiving procedure for 3DTV displays which includes all files, even those stored outside of the project folder, in the archive.

More Information

- "Archiving 3DTV Projects" on page 7-345

QUERYING YOUR FILES

The **Query Tool** displays attribute information about objects in S57charts, as well as about several types of HYPACK® files. When you click the Query Tool icon, the cursor changes to an Interrogate tool. It then displays the attribute information for any object within 2mm of where you click in the area map. All supported objects within range of your query are listed on the left side of the window. Select the object on the left and the information appears on the right.

S57 Charts: Click on any feature in your chart, and the query window presents information about the chart itself, as well as the features at your click location. Some charts have purple information tags. Use the query tool to access the chart information embedded in the chart. Information will be in either text or *.TIF files, which must be in the same folder as the chart file.

FIGURE 1-56. *S57 Feature Information*

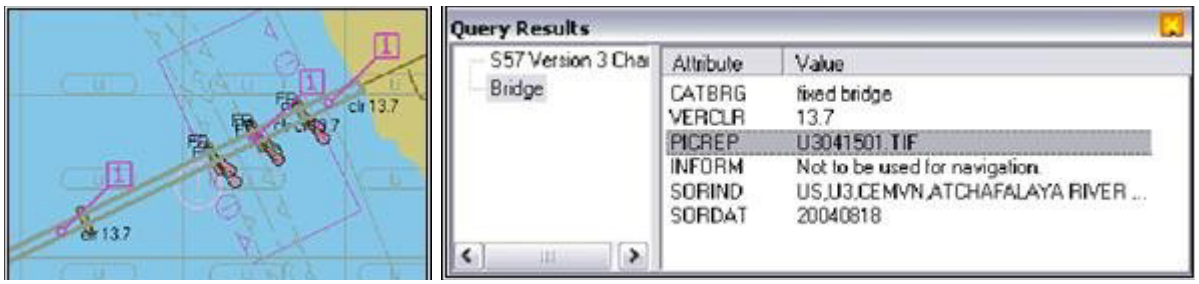
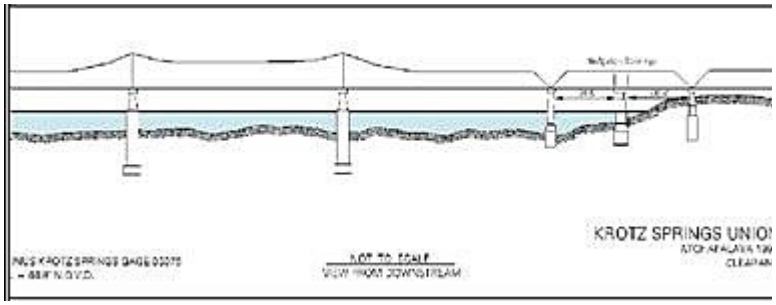


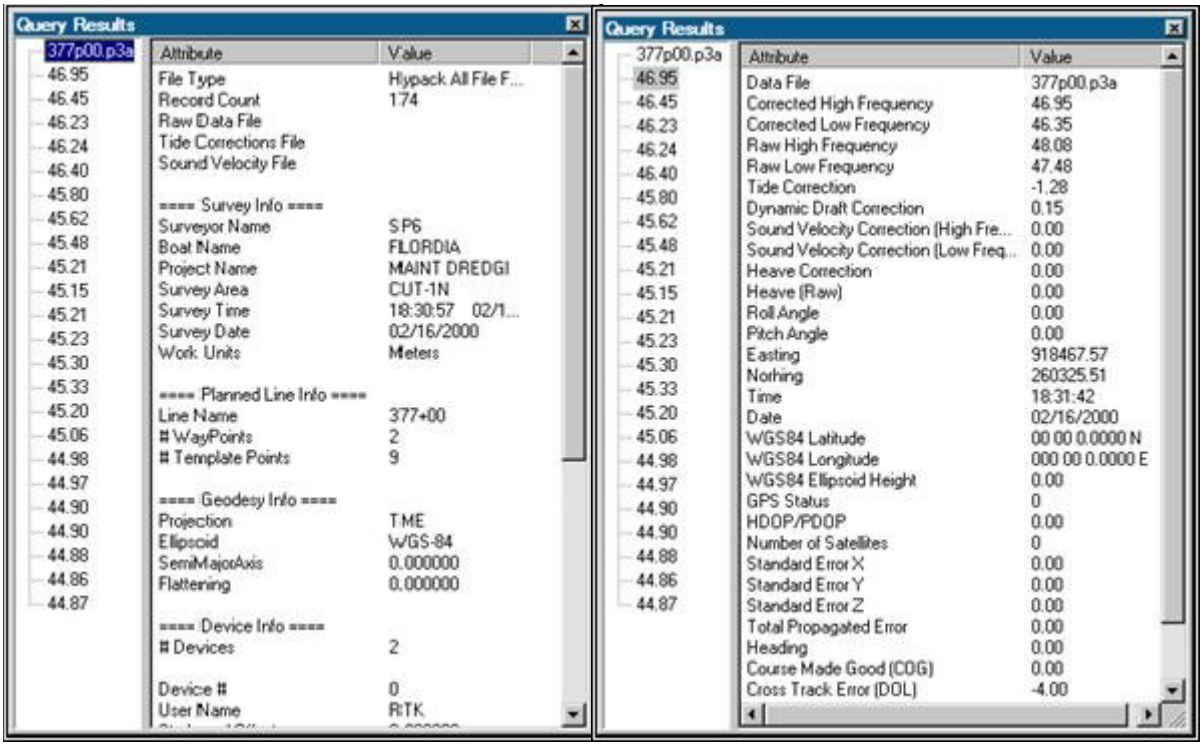
FIGURE 1-57. *Sample S57 Information in TIF format shows a profile view of the bridge queried in the chart.*



HYPACK® All Format Data Files:

Click on a line of All Format data and the query window presents information about the survey and the individual soundings. Select on the line name in the Query window to see survey information, and geodesy and hardware settings. Select a sounding to see statistics about that sounding such as the raw and corrected values, all corrections and quality information.

FIGURE 1-58. *Results of All Format Query.*



HYPACK® DATA FILES

The top section of the Available Files area in the HYPACK® interface lists the data files.

When non-binary data files are enabled in a project, you can choose to:

- draw the soundings
- draw the track lines
- draw both soundings and track lines to the area map.

Make your choice by right-clicking on the data folder and selecting ‘Enable Soundings’ or ‘Enable Track lines’ (or both).

NOTE: Track lines can not be displayed for XYZ files as there is no track line information available in this format.

Other display settings are made in the Control Panel, the Colors dialog and SCHEME BUILDER.

Data files are grouped into three types: Raw, Edited and Sorted data.

More Information

- “Display Settings in the HYPACK® Control Panel” on page 1-22
- “Sounding Color Settings in HYPACK®” on page 1-34
- “Display Schemes” on page 1-45

RAW DATA FILES

Raw files are the data files that result from the SURVEY or DREDGEPACK® program. Every time you go “On Line”, a new “Raw” data file is created. They are ASCII format files that contain the header information and time-series information for each survey device.

By default, they have the extension “*.RAW” and, in a standard HYPACK® project, are stored in the \Hypack\Project\Raw directory. You may choose a naming format or an alternate directory (or both) in the SURVEY program under OPTIONS-PROGRAM INFORMATION.

A list of individual data files is provided in a Catalog (*.LOG) file. You can quickly draw or process a group of files by specifying the *.LOG name, instead of entering the name of each data file.

RAW format files are read through the SINGLE BEAM EDITOR where they are merged with Tide and other corrections and are written as Edited All format files

More Information

- “Raw Data File Options in SURVEY” on page 3-74

EDITED DATA FILES

Upon editing the raw data files to remove outliers and to apply tide and sound velocity corrections, you save the result to an “Edited” Data file. (Requires the Single Beam Processing or Multibeam Processing modules.) In a standard HYPACK® project, edited data files are stored in the “\Edit” directory under the current project. Edited data files of single beam data are stored in an ASCII format (HYPACK® “ALL” Format). Edited data files of multibeam and multiple transducer data are stored in a binary format (HYPACK® “HS2” Format) or the ASCII XYZ format.

A list of individual data files is provided in a Catalog (*.LOG) file. You can quickly draw or process a group of files by specifying the *.LOG name, instead of entering the name of each data file.

More Information

- "SINGLE BEAM EDITOR" on page 4-8
- "HYSWEEP® EDITOR" on page 6-3

SORTED DATA FILES

After running the edited data files through a sounding selection routine, you save the resulting data files to a "Sorted" Data file under the current project. In a standard HYPACK® project, sorted data files are stored to ASCII XYZ format, although one of the routines saves to HYPACK® "ALL" Format. You need the Single Beam Processing or Multibeam Processing modules to get access to the sounding selection programs.

A list of individual data files is provided in a Catalog (*.LOG) file. You can quickly draw or process a group of files by specifying the *.LOG name, instead of entering the name of each data file.

More Information

- "Sounding Selection Programs for Single Beam Surveys" on page 4-54
- "Sounding Selection Programs for Multibeam Surveys" on page 6-111

CATALOG FILES (*.LOG)

A **Catalog File** is an ASCII document that lists a series of other files. As sounding data is collected during SURVEY, the data from each survey line is saved to its own data file in the Raw directory and the data file name is appended to the catalog file. For example, if you are surveying on December 27th, a Catalog file named "RAW_1227.LOG" will be created. If you shut down the SURVEY program and re-start it during the same day, it will re-open any existing Catalog file and append the names of new Raw data files to it.

The Catalog file is handy when processing or performing batch operations on the data files. Instead of having to enter the name of 50 different data files, you need to only enter the name of the Catalog (*.LOG) file.

Catalog files are named using the identifier "LOG" and the date of survey. They are written to the same directory where your data files are stored. (All data files must be in the same directory.) When you edit the data files, the edited files are stored to the Edit directory and a new catalog file of the edited files is created. The same applies to sorting files. The sorted

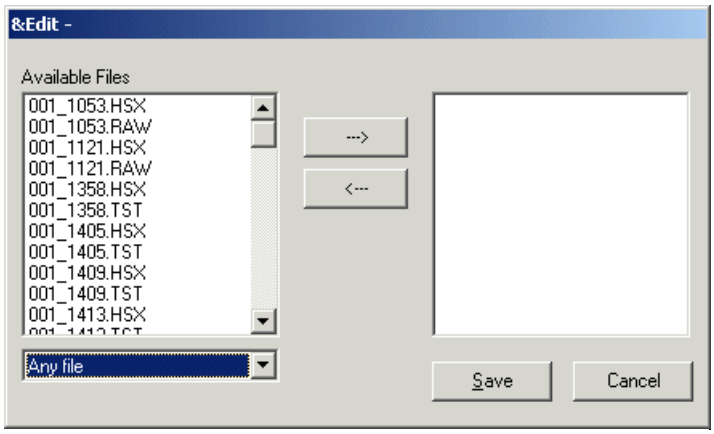
files are stored to the Sort directory and a catalog file of the sorted files is created.

CREATING A NEW CATALOG FILE

On occasion, you may want to create a Catalog file that is different from one automatically created by HYPACK®. The procedure is simple.

1. **Right-click on the project data folder in the Data Files List and select CREATE NEW LOG FILE from the drop-down menu**. A dialog will appear with a listing of all data files in the data folder.

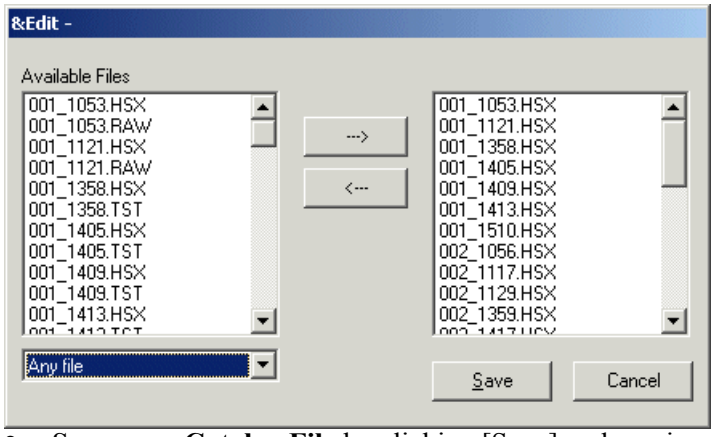
FIGURE 1-59. *Creating a New Catalog File (Before)*



If there are multiple file extensions represented in the directory, you can choose to list only files with the extension of your choice by selecting it in the drop-down list at the bottom left.

2. **Select the file names you wish to include and click [Add].**

FIGURE 1-60. *Creating a New Catalog File (After)*



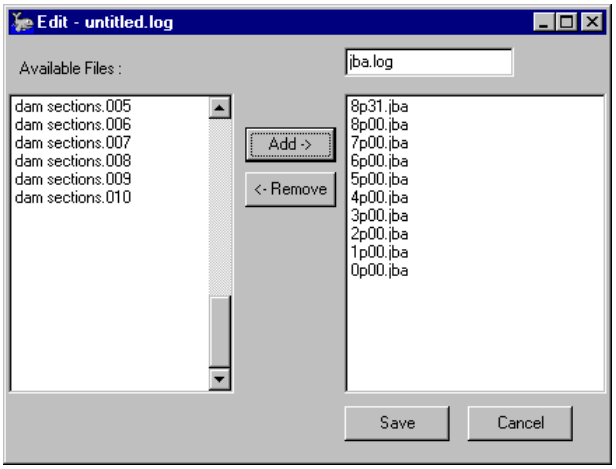
3. **Save your Catalog File** by clicking [Save] and naming your file. HYPACK® will save your file with the LOG extension in the same directory (Raw, Edit or Sort) that you originally chose.

EDITING CATALOG FILES

You can also edit existing Catalog files.

1. **Right-click on a LOG File in the Data Files list and select EDIT LOG FILE** from the drop-down box. A dialog will appear listing the files in the catalog and other files available in the project.
2. **Delete line files** from the list by selecting them then clicking [Remove].
3. **Add available line file(s)** by selecting them then clicking [Add].

FIGURE 1-61. *Edit Log File Dialog*

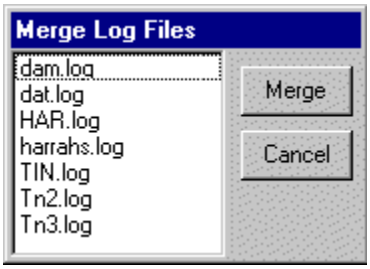


MERGING CATALOG FILES

You can also merge the files contained in multiple Catalog Files together.

1. **Right-click on the project data folder in the Data Files List and select Merge Log Files from the drop-down menu**. A dialog will appear with a listing of all catalog files in the data folder.

FIGURE 1-62. *Merging Catalog Files*



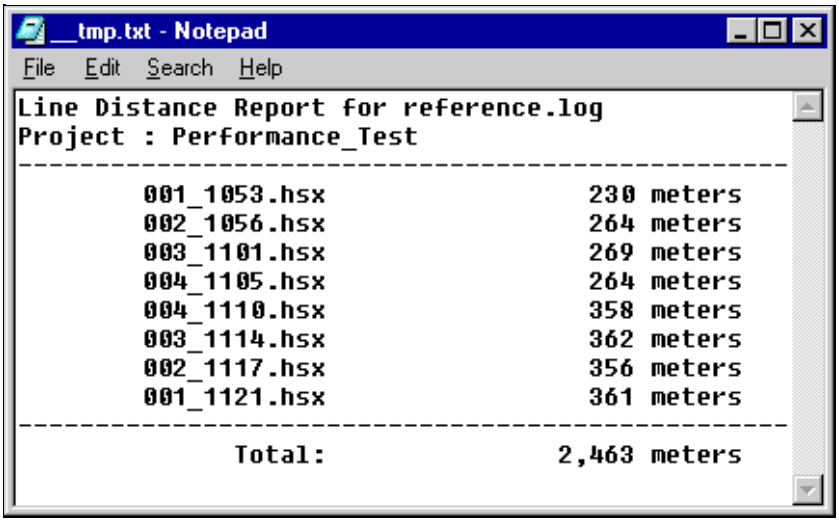
2. **Select the file names you wish to include** by holding the control key while making your selections.
3. **Click [Merge] and name your new file.** HYPACK® will save your file with the LOG extension in the same directory (Raw, Edit or Sort) that you originally chose.

SHOW LINES REPORT FOR CATALOG FILES

A Lines Report, is an ASCII text file listing each of the lines in the catalog (or the selected line) and distance traveled while logging --the distance surveyed.

Right-click on a catalog file (or on an individual survey data file) and select Show Lines Report.

FIGURE 1-63. *Sample Show Lines Report*



HYPACK® PROJECT FILES

The middle section of the left-hand area contains a list of files used in the project. Files can be added by right-clicking on the desired file type. These contain the following available items:

Advanced Channel File (*.CHN): A channel design file contains a description of the geometry of an area. It is created in the ADVANCED CHANNEL DESIGN program and can be used in the TIN MODEL program to calculate the volume between a surveyed surface and the channel surface. A channel file can be displayed in DREDGEPACK® and MATRIX 3DTV to guide your data collection or in the HYSWEEP® EDITOR to guide the editing process.

Background charts provide context and navigational reference for your work. HYPACK® displays several types of electronic charts in the area map and in the survey and editing programs.

NOTE Charts drawn in XY (DGN, DXF, DIG, TIF and SHP) *must be in the same geodesy as your project* to be positioned correctly. Charts drawn in WGS-84 (C-Map, S57, VPF), the SURVEY program will transform the data files to the local datum, using the datum transformation parameters in the GEODETIC PARAMETERS program before converting them to your projection. This allows you to use these file formats on any projection.

Border Files (*.BRD): A user-defined listing of XY positionsthat defines an area in your project area. Border files are created in the BORDER EDITOR and saved to your project directory. They have several uses:

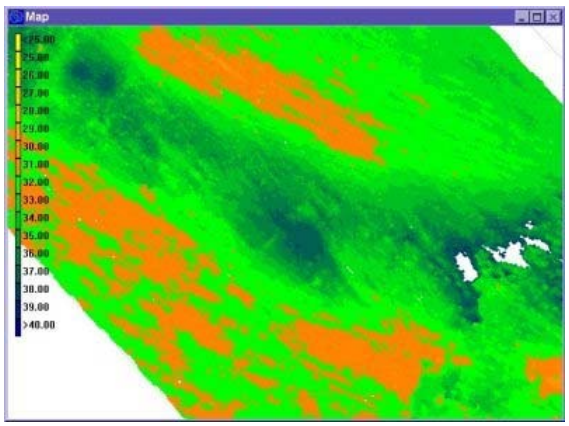
- To clip survey lines and XYZ data files to fit within a coastline or unorthometric survey area.
- They may be used in SURVEY or DREDGEPACK® to edit defined areas in a matrix.
- Define areas in the HYSWEEP® EDITOR where search and filter options will or will not be applied.
- To limit areas where volumes are calculated in TIN MODEL or CROSS SECTIONS AND VOLUMES.
- To clip TIN models.

Channel Plan Files (*.PLN) are used in the creation of 3-dimensional Planned Line Files. They are created in the CHANNEL DESIGN program and saved to your project directory. Channel Plan Files contain grid coordinates for the channel centerline, left-toe and right-toe lines, and turning basins. A PLN file can also be displayed in the DREDGEPACK® profile window.

Kinematic Tidal Datum Files (*.KTD) are used in the SURVEY program when determining real time water levels using an RTK GPS system. Created in the KTD EDITOR, they provide information regarding the separation between the reference ellipsoid surface and the local chart datum for a large geographic area.

Matrix files (*MTX) are gridded rectangular areas. You can fill the cells with depth information from your echosounder or dredge cutting tool in real time during data collection, or in post-processing.

FIGURE 1-64. *Matrix File in the SURVEY Program*



Empty Matrix files are typically created in the MATRIX EDITOR and are saved to the project directory.

Planned survey lines (*.LNW) are used to define where you want your vessel to go. The line file contains the grid coordinates and names for each planned line in your survey area and can also contain cross section template information. Line Files are typically created in either the LINE EDITOR or the CHANNEL DESIGN program.

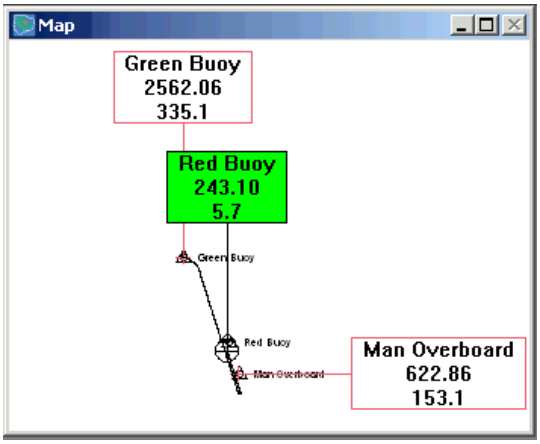
Plotting Sheet Files (*.PLT) contain origin coordinates, scale, rotation, and sheet dimensions for plotting on smooth sheets. These files are typically created in the PLOTTING SHEET EDITOR and saved with the .PLT extension to your project file. They are used by HYPLOT to define the area to be plotted.

Target Files (*.TGT) contain name and position information for a series of objects. You can create a target file manually, using the TARGET EDITOR then import it into the SURVEY program. This enables you to navigate *to* pre-determined locationsor *away* from areas dangerous for navigation. You can also mark targets at points of interest in SURVEY or DREDGEPACK® and save them to a target file.

They can be displayed in the 3D Terrain Viewer, plotted in the HYPLOT program and exported to DXF or DGN formats using EXPORT.

Target display settings are defined in the HYPACK® control panel and in SURVEY and DREDGEPACK® through the target properties and parameters.

FIGURE 1-65. *Targets in SURVEY.*

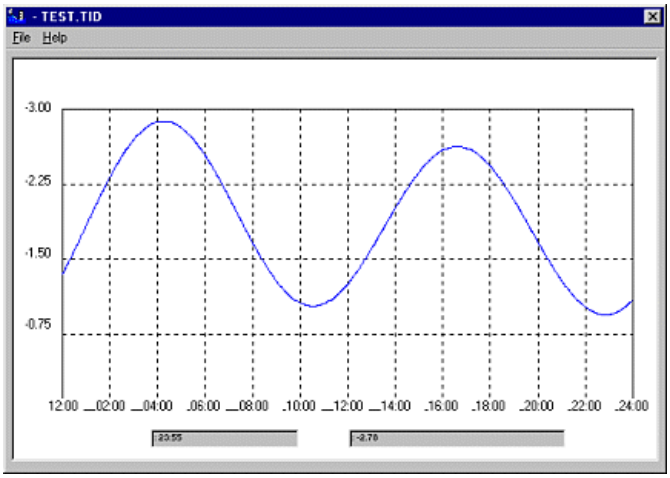


Template Files (*.TPL) created in the Template Editor of CROSS SECTIONS AND VOLUMES or the LINE EDITOR, contain the channel cross-section design information. They can be displayed in the Profile windows in SURVEY or DREDGEPACK® or used in the CROSS SECTIONS & VOLUMES program.

Tide Correction Files (*.TID) are created in the HARMONIC TIDES and MANUAL TIDES programs. They contain corresponding tide and time information that can be used in the SINGLE BEAM EDITOR or the HYSWEEP® EDITOR to apply water level corrections to your sounding data. For each day included in the file, there is one correction value for every minute in the 24 hr. period for a total of 1,440 records per day. A multiday file marks the beginning of each day with its date.

You can display a graph of any TID file in your project by right-clicking on the file in the Project Files list and selecting ‘Graph’. The Tide Viewer will appear with the graph of the selected tide file..

FIGURE 1-66. *Tide Viewer*



While in the Tide Viewer, you can:

- **View a different tide corrections file** by selecting FILE-OPEN.

- **Save an image of the graph to a BMP file** by selecting FILE-SAVE AS and naming your file.
- **Print the graph** by selecting FILE-PRINT SCREEN.

CHAPTER 2

Preparation

PREPARATION OVERVIEW

Before you begin your work in your project area, there are several tasks to consider:

1. **Create a new project.** You can create a new project and all of the files in it by using the FILE-NEW command or copy an existing project using the FILE-COPY menu command.
   - **When you create a new project**, it will "inherit" the last settings for geodesy and hardware.
   - **When you copy a project**, it copies everything from the previous project, with the exception of the data files.
2. **Check your Geodesy.** If you have not previously specified your geodesy, enter the GEODETIC PARAMETERS program and configure your geodesy.
3. **Configure and calibrate your hardware.** If you have not previously specified your sensors, configure your equipment in the appropriate hardware program.
   - Configure positioning devices and single beam survey equipment in HYPACK® HARDWARE.
   - Configure multibeam survey equipment in HYSWEEP® HARDWARE.
   - Configure side scan devices in SIDE SCAN HARDWARE.
4. **Create your planned survey lines.** (Optional)
   - **If you have copied a project** with one or more line files, they will be copied into the new project.
   - **If you are working on a new *survey* project,** you will probably want to create planned survey lines to assure even coverage.
   - **If you are working on a new *dredge* project**, you may also choose to view your coverage in a matrix file.
5. **Prepare and load other support files as needed**. These may include:

- Background charts
- Channel files
- Matrix files
- Target files
- Vessel shapes
- Schemes

More Information

- “Projects in HYPACK®” on page 1-50
- “Background Charts” on page 2-3
- “Entering your Geodetic Parameters” on page 2-44
- “Planned Survey Lines” on page 2-71
- “Hardware Setup in HYPACK®” on page 2-120
- “Side Scan Hardware” on page 2-149
- “HYSWEEP® HARDWARE” on page 2-158
- “Calibrating your Hardware” on page 2-168
- “Creating a Matrix File with the Matrix Editor” on page 2-254
- “Creating a New Target File” on page 2-262
- “Advanced Channel Design” on page 8-81
- “Creating a Boat Shape” on page 8-28
- “Display Schemes” on page 1-45

BACKGROUND CHARTS

Background charts provide context and navigational reference for your work. HYPACK® displays several types of electronic charts in the area map and in the survey and editing programs.

NOTE Charts drawn in XY (DGN, DXF, DIG, TIF and SHP) *must be in the same geodesy as your project* to be positioned correctly. Charts drawn in WGS-84 (C-Map, S57, VPF), the SURVEY program will transform the data files to the local datum, using the datum transformation parameters in the GEODETIC PARAMETERS program before converting them to your projection. This allows you to use these file formats on any projection.

Most background files will be imported from external sources. HYPACK® supports the following electronic chart formats:

- ARCS
- BSB
- C-Map Ed. 2
- DIG
- DG2
- DGN v7 and v8[a]
- DWG[b]
- DXF
- S57
- S63
- SHP
- VPF
- TIF

a. DGN Version 8 for display only.

b. DWG used as chart display in any chart-supporting module, and as source or destination file in EXPORT TO CAD.

You may also create background files in several HYPACK® programs and save them to the project.

Module	Chart Type
ENC EDITOR	S57
DG2 EDITOR	DG2
HYPACK	Geo-referenced TIF
TIN MODEL	Geo-referenced TIF, DXF
SIDE SCAN TARGETING AND MOSAICKING	Geo-referenced TIF
CLOUD	Geo-referenced TIF
EXPORT	DXF, DGN v7, DWG

More Information

- "Creating Geo-referenced TIF Files in Mosaic Mode" on page 5-39
- "Exporting Geo-Referenced TIF Files from TIN Model" on page 7-146
- "ENC Editor" on page 7-200
- "Exporting Geo-Referenced TIF Files from Cloud" on page 8-225
- "CAD Output Settings in Export" on page 7-182
- "Background Charts Supported in HYPACK®" on page 10-106

LOADING BACKGROUND CHARTS TO THE PROJECT

Most charts are loaded to the project in the same manner.

Method 1:

1. **Right-click Background Files** in the Project Files list.
2. **Select "Add File" or "Add File & Copy"**.
3. **Choose the file** and the file will be drawn to the screen and enabled in the Background files list at the left.
   - **If a background file has been saved to the project**, select "Add File" and select the file type from the list displayed. A file selection dialog will appear for you to select the background file from your project file.
   - **Import a background file** by right clicking on Background Files and selecting "Add & Copy File". A file selection dialog will appear allowing you select a file from outside the project folder. Select the correct file, and the chart will be copied to the project file and drawn to the screen.

Method 2:

1. **Use Windows® Explorer to find and select your charts**.
2. **Drag the selected charts to the HYPACK® Map window**. The selected files will be copied to your project folder and enabled.

NOTE You can use a chart that is not stored in your project directory by using the Add File option and selecting it from the directory where it resides. This is useful if you are using very large chart file that takes excessive space on your hard drive.

Beware!

BEWARE! Saving the project file will not save a background file that has not been copied into the project file. The chart must remain where it is on your system when you add it to the project so HYPACK® can find it when you open the project.

ARCS, BSB version 4, S63 charts and C-Maps have special procedures that must be followed before you can add them to your project.

HYPACK® attempts to draw your data in an order which will optimize the display of all enabled files. Occasionally, modifications to the draw order are required and may be made by creating a custom draw order.

More Information

- "Setting Chart Display Order" on page 1-42

LOADING ARCS CHARTS TO HYPACK®

British Admiralty ARCS charts are electronic raster charts. World-wide coverage is provided by these charts and updates are available throughout the year according to your permit agreement.

To display ARCS charts in HYPACK®:

1. **Acquire the ARCS Charts for your survey area.** If you have multiple HYPACK® licenses (hardlocks) and you want more than one to have ARCS capability, you will need to purchase multiple ARCS permits.
2. **Load your charts to your hard drive**.

Beware!

BEWARE! Any time that you load ARCS charts to your HYPACK® project, you must use the same hardlock that was used to load the chart permits to that computer. You must load your chart permits through the ARCS Manager each time you change hardlocks.

3. **Load the charts to HYPACK®**. You may only need a portion of the charts that you have purchased in a project. Load only those charts that correspond to your project area.

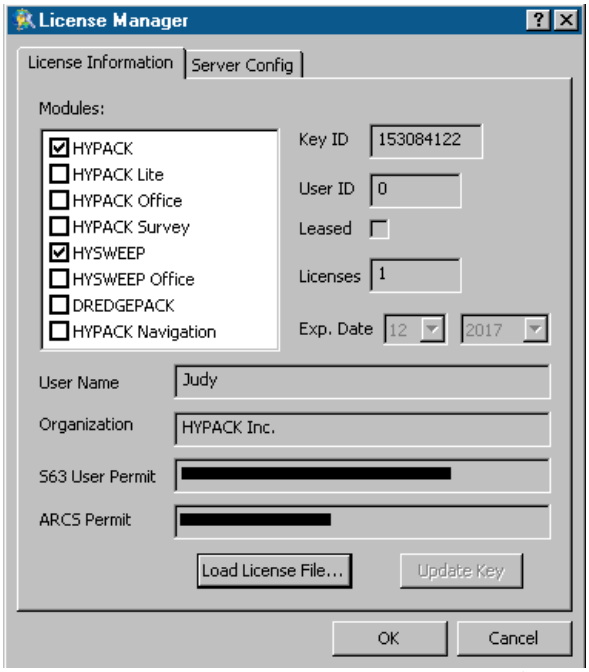
ACQUIRING YOUR ARCS CHARTS

Arcs charts and their permits can be purchased from an authorized distributor or reseller.

1. **Get the ARCS User Permit and PIN from the Hardlock program** (UTILITIES-HARDLOCK PROGRAM).

NOTE: Each HYPACK® license comes with a separate ARCS User permit.

FIGURE 2-1. The Hardlock Program displays your ARCS PIN and ARCS User Permit numbers. (The actual numbers have been masked in this image.)



2. **Purchase your charts and chart permits**. You will need a set of ARCS chart permits (one for each chart) for each HYPACK® license for which you would like ARCS capability.
   - **When you contact your ARCS distributor/reseller, they will need to know:**
     - the user permit
     - PIN
     - you are using the charts in HYPACK®.
   - **You will receive from them:**
     - Your base charts on a CD
     - An Update CD
     - Chart permits on a floppy disk

Since each ARCS permit is specific for only one HYPACK® license (hardlock), if you have multiple hardlocks, we suggest that you develop a system to easily determine which hardlock and ARCS permit number go together. You may want to label each hardlock with its ARCS permit number.

Loading ARCS Charts to Your Hard Drive

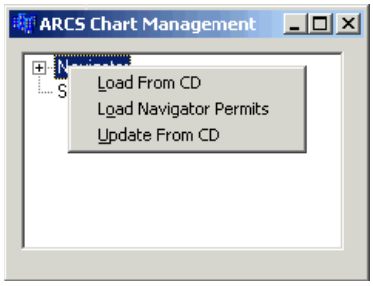
The ARCS MANAGER is a stand-alone program used to select and load ARCS charts from the CD to your Hard Drive.

1. **Launch the ARCS MANAGER** by selecting DRAW-BACKGROUND FILES-ARCS. The ARCS Chart Manager dialog will appear.

   This program is run through pop-up menus that you access by right clicking Navigator or Skipper according to which permit you have

purchased. Each of the following steps requires that you first access this menu.

FIGURE 2-2. The ARCS Management Utility is driven by right click menus.



2. **Select Load from CD**. The ARCS manager will search all CDs for the ARCS base charts and list them into a check list box.

TIP: To determine which CD your charts reside on, you can search the ARCS catalog on the ARCS website (http://catalogue.ukho.gov.uk/browse_ARCs_home.asp).

3. **Select/check the charts you are interested in and load them**.
4. **Load the permits into the system**. Select Load Navigator/Skipper Permits. A File Select dialog will appear for you to select your permit file.

TABLE 2-1. ARCS Permit Files

Permit	File Name
Navigator	GB.NCP
Skipper	GB.SCP

Chart Permits are typically supplied on a floppy. If your PC does not have a floppy drive, you can copy the file over a network or contact your ARCS source to receive the required file by another means.

5. **Update your selected charts from the Update CD** (optional but recommended).
   a. **Select "Update from CD"**. The program will search all CDs for presence of ARCS update files and will list them into a check list box (same as Load from CD).
   b. **Select the appropriate chart updates** for your purposes to apply them.

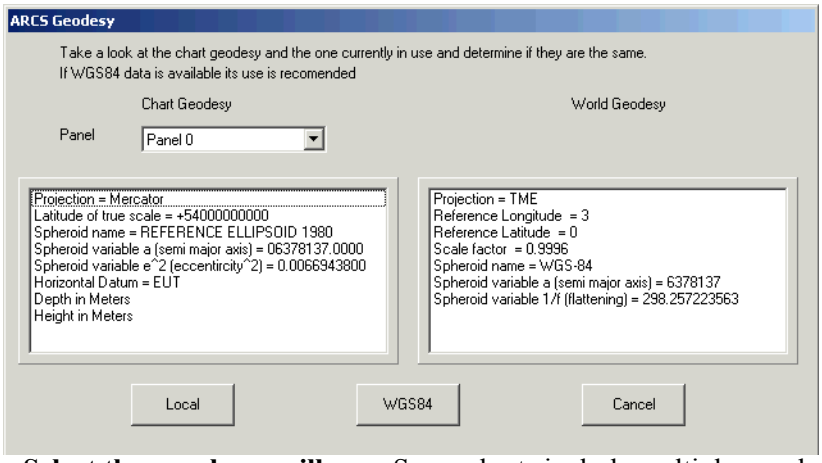
LOADING ARCS CHARTS TO YOUR PROJECT

The procedure for loading ARCS charts to your project begins as it would for most other background charts, but you must also geo-reference your chart so that it will coordinate with your project geodesy settings and overlay properly in your map windows.

1. **Right-click Background Files** in the Project Files list and select ARCS. A File Open dialog will appear for you to select the charts you want to load.

2. **Select your chart and click [OK].** The charts will be saved to your HYPACK\ARCS\Navigator or HYPACK\ARCS\Skipper folder, according to the type of permit you have. Click [OK] and the ARCS Geodesy dialog appears.
3. **Geo-reference your chart**.

FIGURE 2-3. *ARCS Geodesy dialog*



4. **Select the panel you will use**. Some charts include multiple panels. If this is the case, they will be listed in the Panel drop-down box.
5. **Compare your Chart and World geodesy settings**. The Chart geodesy is part of the chart file. Most charts come with geodesy information relative to the geodesy the chart is drawn in (chart geodesy) and WGS-84. (If there is no WGS-84 information for your selected chart, [WGS84] will be disabled.) Your goal is to get your chart geodesy coordinated with your project geodesy.
6. **Choose your geodesy conversion method** and the program will return you to the HYPACK® screen.
   - **If your chart has WGS84 information** ([WGS84] is enabled), we recommend that you use this option.
   - **If the Chart and World Geodesy settings are different**, you must use the WGS-84 selection to achieve proper overlay of your chart with your other project data.
   - **If the Chart Geodesy (left) matches the World Geodesy** (right, read from your geodetic parameters) you can choose either option.
   - **If the Chart and World Geodesy settings are different AND your chart has only Chart geodesy settings,** the chart will not work in this HYPACK® project.

LOADING BSB VERSION 4 CHARTS TO THE PROJECT

BSB ver. 3 charts (*.KAP) have been supported by HYPACK® for years. These are not encrypted so you can just add them to your project using one of the 'Add File' commands. These charts covering regions in

the United States may be downloaded, free of charge, from either the NOAA site (http://chartmaker.ncd.noaa.gov/mcd/Raster/Index.htm) or www.freeboatingcharts.com sponsored by Maptech.

BSB ver. 4 charts (*.CAP) are encrypted and require licensing. Any time you load a CAP file to your project, HYPACK® will check for the proper licensing before it will add the chart.

To load BSB ver. 4 charts:

1. **Run the install program from the BSB ver.4 Chart CD**. This registers your license on your computer so this process must be done on each computer on which you intend to run your project.
2. **Open your project**.
3. **Load the chart using the 'Add File and Copy' option**. HYPACK® will check for your BSB license then copy the *.CAP and its corresponding *.BSB file to your project folder. Both files are required to display the version 4 charts.

LOADING C-MAPS TO THE PROJECT

C-Maps are nautical charts in digital format. World-wide coverage is provided by charts in this format. Updates are distributed 3 times each year by C-Map.

C-Maps are available in 8 different scale ranges.

A:	World Scale	1:3,500,000 to 1:1,500,000
B:	General Nautical Scale	1:1,500,000 to 1: 500,000
C:	Coastal Scale	1: 500,000 to 1: 150,000
D:	Intermediate Scale	1: 150,000 to 1:50,000
E:	Approach Scale	1:50,000 to 1:15,000
F:	Harbor Scale	1:15,000 to 1:5,000
G:	Port Plan Scale	1:5,000

Any location in the world is at least included in an A-level C-Map. There may also be smaller scale charts available that include your area of interest. To see what charts are available, one-by-one, select each of the scales (B-G) listed in the C-Map View Dialog. After each selection, a world map displaying the areas covered by maps of that scale will appear. As you view each display, notice which scales show maps in your area of interest.

NOTES: HYPACK® supports the display of C-Map CM93 Edition 2 charts. Due to changes in C-Map's encryption scheme, we are unable to support Edition 3 C-Maps.

Even after you have successfully loaded your charts and copied them to your project, you must still have your C-Map CD in your

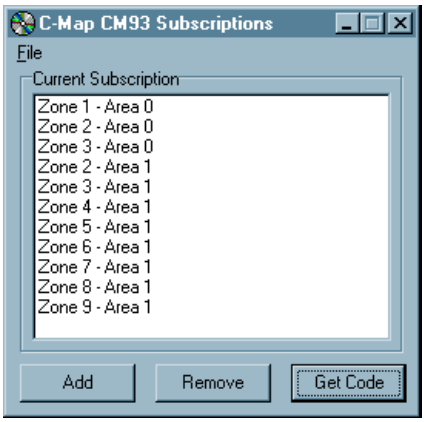
CD-ROM drive when you launch HYPACK to display your C-Map charts.

C-MAP AUTHORIZATION

The first time you load C-Maps, or if you have purchased additional C-Maps, you will need to install an authorization code from C-Map. This code makes those charts that you have purchased available for viewing.

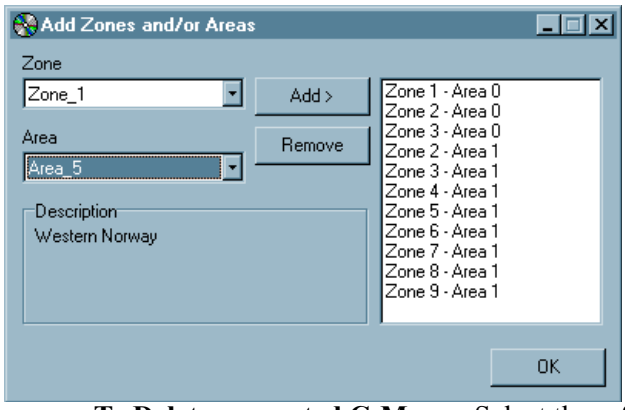
1. **Start the C-Map Lock program** from the Windows® Start Menu. Select START-RUN and select CM93Lock.exe from the HYPACK® directory. A dialog will appear with your current subscription listed. If you have not used C-Maps before, there will be no list.

FIGURE 2-4. *Current C-Map Subscriptions*



2. **Edit your subscription list**.
   - **To Add C-Maps:** Click [Add] and another dialog will appear to enable to edit your C-Map subscription list. Select the Zone and Area for each C-Map you wish to use and click [OK]. The selected C-Maps will appear in your subscription list.

FIGURE 2-5. *Editing your Subscription List*



   - **To Delete unwanted C-Maps:** Select them from the list and click [Delete].

3. When you have completed your selections, **click on [Get Code].** The current access code will be displayed.

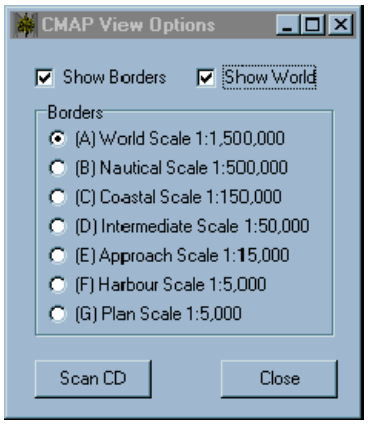
4. **Contact C-Map and report to them the access code from the screen**. They will give you the necessary 18-digit Authorization Code for the selected cells.
5. **Select FILE-ENTER AUTHORIZATION and enter the Authorization Code in the dialog displayed and click [OK].** A message will appear confirming your new authorization.

SCANNING YOUR C-MAP CD ROM

The first issue in loading C-Map Charts is to be sure the C-Map CD has been scanned. Scanning only needs to be done when you use a CD with the program for the first time or if you change CD's. This enables HYPACK® to know what Charts are available to you on the CD.

1. **Insert your C-Map CD into the CD ROM drive**.
2. **Select DRAW-BACKGROUND FILES-CMAP.** The C-Map View Options dialog will appear.

FIGURE 2-6. *The C-Map View Options dialog*



3. **Click [Scan CD].** You will see the progress of the Charts being read at the bottom center of your screen. When the count is finished you will see "Ready" displayed in that same place and you can proceed with the loading process.

SELECTING A C-MAP

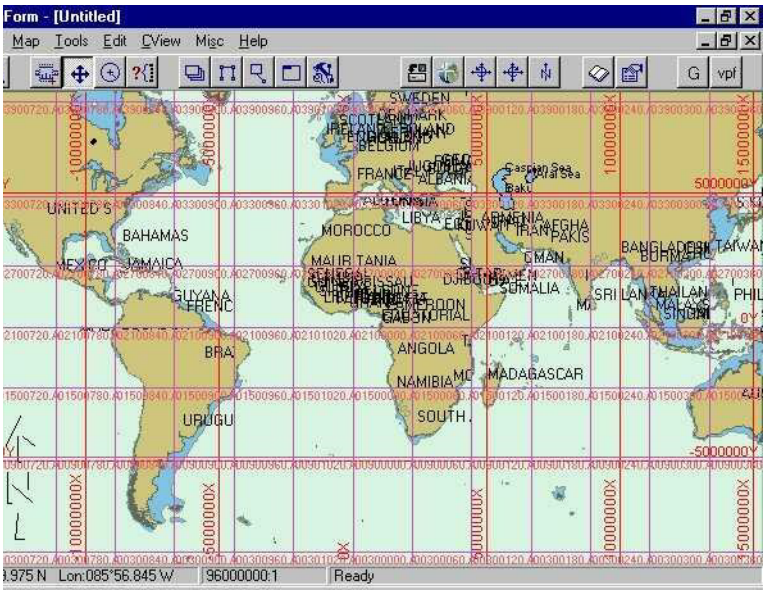
Once you have scanned the C-Map CD, you can choose the C-Maps for your HYPACK® project display.

1. **Check Show Borders** to see the C-Map areas defined by pink grid lines.
2. **Check Show World** to load a world map to your screen. You should now have a world map with the A-level, World Scale maps defined by pink grid lines and Lat/Long or XY grids marked with a red grid. C-Map Chart numbers are displayed at the top left corner of each map

NOTE: In some cases, the C-Map display may appear chaotic. This happens when the project geodetic parameters are not compatible with this display. If this occurs, open the GEODETIC PARAMETERS program and temporarily change the Grid to None and the Projection to C-Map Mercator. This

should correct your C-Map display so you can easily view and load your charts. Remember to restore the project geodetic parameters before you begin to survey!

FIGURE 2-7. *World Map with Grid Lines*



3. **View available C-Maps**. Note that if you have not purchased all levels of Charts from C-Map, only those you have purchased will be displayed.

FIGURE 2-8. *C-Level C-Map*

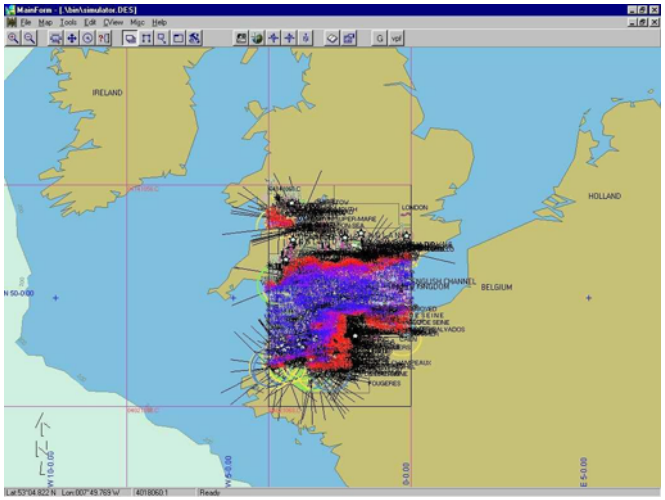


FIGURE 2-9. *D-Level C-Map*

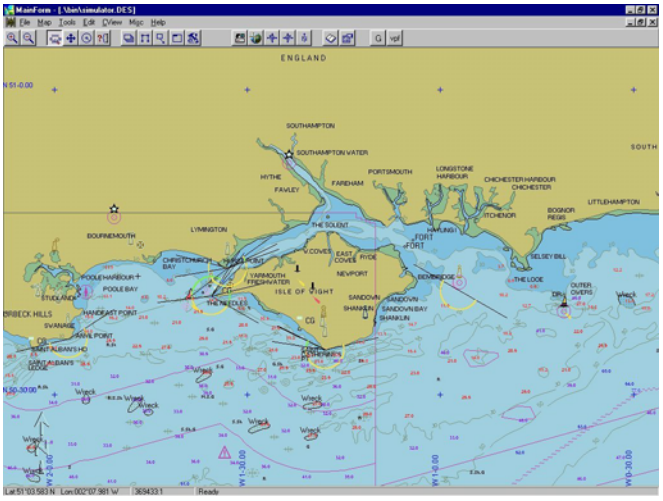


FIGURE 2-10. *E-Level C-Map*

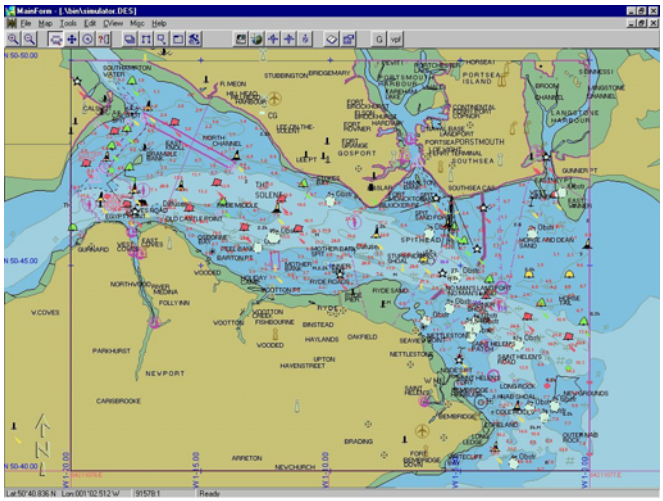
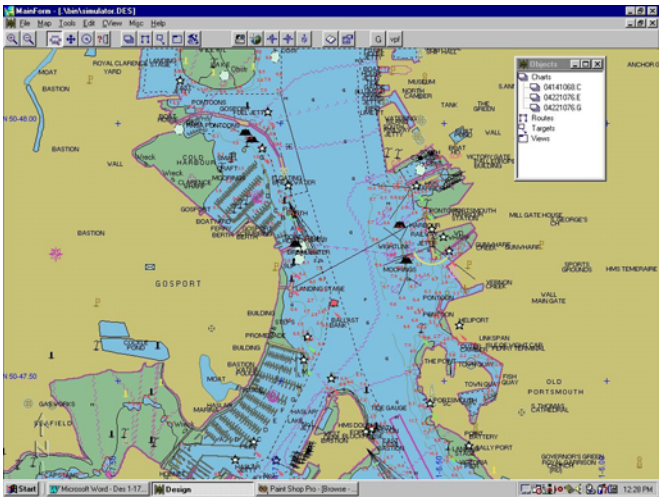


FIGURE 2-11. *G-level C-Map*



4. **Select your C-Maps**.
   a. **Zoom-in to the area where you will be traveling.** Click on the Zoom Area icon and define an area somewhat larger than your area of interest.
   b. **Select the scale of Chart you wish to load** by selecting it from the C-View menu.
   c. **Select the Chart or Charts that include all or part of your area of interest.** Click on the Map Tool icon on the screen control bar, and the cursor will change to a rectangle with an arrow. Click inside the areas marked by the grid lines. When you select a chart, the borders will change to gray and the map details will appear. That Chart has now been added to your project.

NOTE: You may choose Charts from more than one scale level to cover your Design area. The Charts will be displayed on your screen with the smallest scale (most detailed) map on top, regardless of the order in which they are loaded.

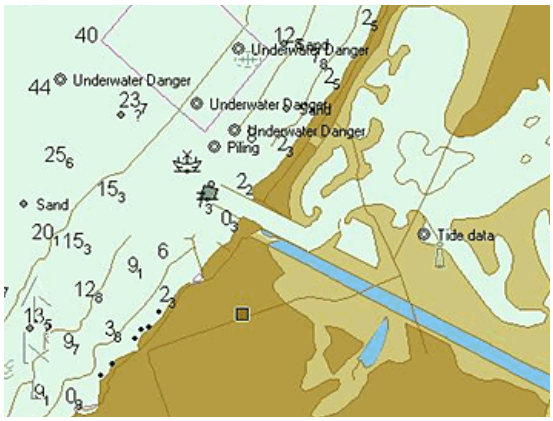
Even after you have successfully loaded your charts and copied them to your project, you must still have your C-Map CD in your CD-ROM drive when you launch HYPACK® to display your C-Map charts.

To Deselect a Chart, just click in the area again. The Chart will be unloaded and the borders will return to pink.

LOADING VPF CHARTS TO THE PROJECT

Vector Product Format (VPF) is an electronic chart format from the U.S. National Imagery and Mapping Agency (NIMA, formerly DMA).

FIGURE 2-12. Sample VPF Chart in HYPACK®



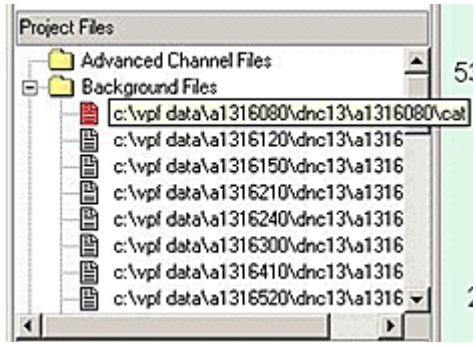
VPF files are loaded in similar manner to other charts, but they have a little quirk that might be confusing.

Method 1:

1. **Right-click and select 'Add File'**.
2. **Scan the VPF database for the CAT file** (no extension) for the chart you want to load.

NOTE: It is helpful to have the 'Full Paths in Tree' option checked in HYPACK® to see which VPF files are loaded. Otherwise you will only see a list of files all named CAT.

FIGURE 2-13. Loading VPF Charts

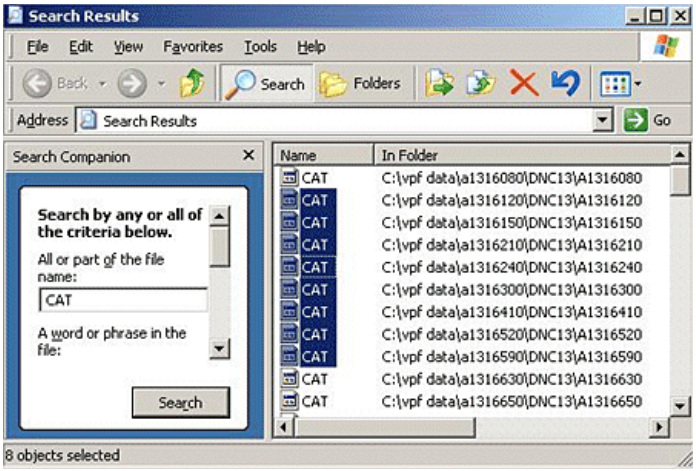


Method2:

Adding several VPF files using the Add File option can be cumbersome, as you will likely have to browse through several levels to the CAT file each time. Windows® Explorer provides an easy alternative.

1. **Open a search window in Explorer and search for 'CAT'**.

FIGURE 2-14. *Results of a Search on 'CAT'*



2. **Select the VPF files you want then drag and drop them onto the HYPACK® map window**.

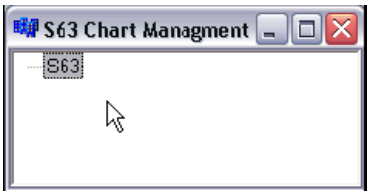
LOADING S63 CHARTS TO THE PROJECT

S63 Charts are encrypted S57 charts. They are encrypted using the IHO Data Protection Scheme. In HYPACK®, this requires:

- **A hardlock encoded for S63 chart security**. Hardlocks burned beginning in Jan 2006 will automatically be encoded. Users without the S63 encoding may return their keys to HYPACK® to update the encoding.

1. **Certificate and the permits** for the charts you are using. The certificate, charts and permits are loaded through the S63 Manager.
2. **Place your S63 chart CD in your CD drive**.
3. **Select DRAW – S63 MANAGER.** The manager window will appear.
4. **Load the Certificate.**
   a. **Select FILE-LOAD CERTIFICATE**. A File Select dialog will appear.
   b. **Navigate to your CD drive and select the Primar.CRT file.** The S63 Manager will display an 'S63' tag..

FIGURE 2-15. *S63 Tag Indicates the Certificate is loaded.*

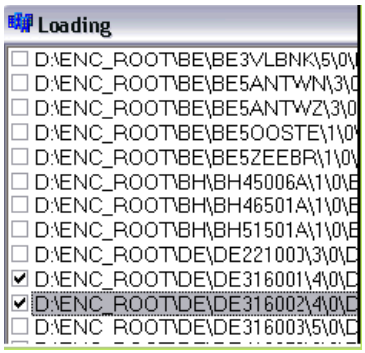


5. **Load your Charts**.
   a. **Select FILE-LOAD FROM CD.** The Loading dialog will appear with a listing of the available charts.

b. **Select each chart that you want to load**.

c. **Click [Load from CD].** The charts will be loaded and their names will appear in the S63 MANAGER.

FIGURE 2-16. *Selecting your S63nCharts*

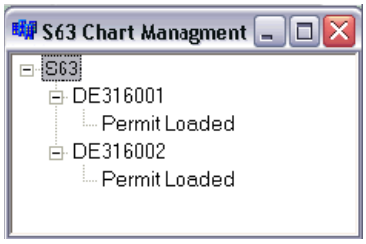


6. **Load the Permits**.

a. **Select FILE-LOAD PERMIT**. A File Select dialog will appear.

b. **Navigate to the ENC.PMT file on your CD double-click it.** In the S63 MANAGER, the words 'Permit Loaded' will appear after each chart.

FIGURE 2-17. *S63 Charts and Permits are Loaded*



7. **Exit from the S63 MANAGER and load your charts** as usual.

CHART DISPLAY OPTIONS

Some chart types have display options unique to their file type. Some of these display options are set in the Charts tab of the Control Panel. Other options are accessed by right-clicking on the chart name in the Project Files list.

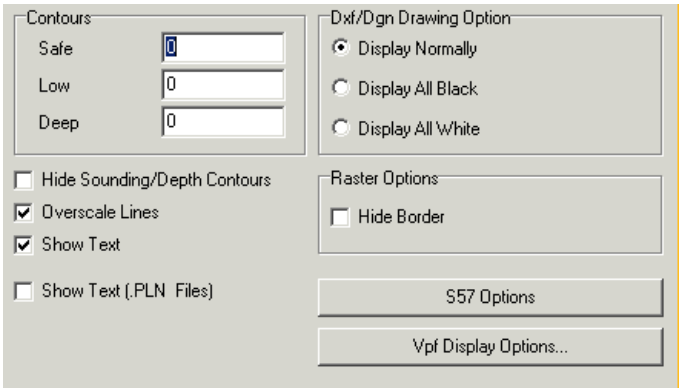
More Information

- "Setting Chart Transparency" on page 1-41
- "Setting Chart Display Order" on page 1-42

DISPLAYING DXF AND DGN CHARTS

You can draw any DGN or DXF file "as is", or in black or white regardless of whether the original chart is in color. Select your choice in the Charts tab of the Control Panel.

FIGURE 2-18. *DXF/DGN Drawing Options in the HYPACK® Control Panel*



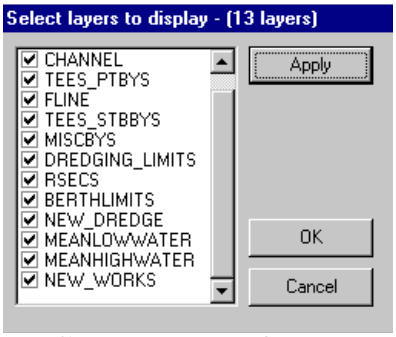
To override the setting in the Control Panel, right-click on the file name in the Project Files list, and select DISPLAY OVERRIDE and your desired setting.

To return to the setting in the Control Panel by selecting DISPLAY OVERRIDE-PROGRAM SETTING in the right-click menu.

To select the layers/levels of these charts to be displayed:

1. **Right-click on the enabled chart in the Project Files list and select the DXF Layers/DGN Levels option.** A dialog will appear with the chart layers/level listed.

FIGURE 2-19. *Selecting DXF Layers*



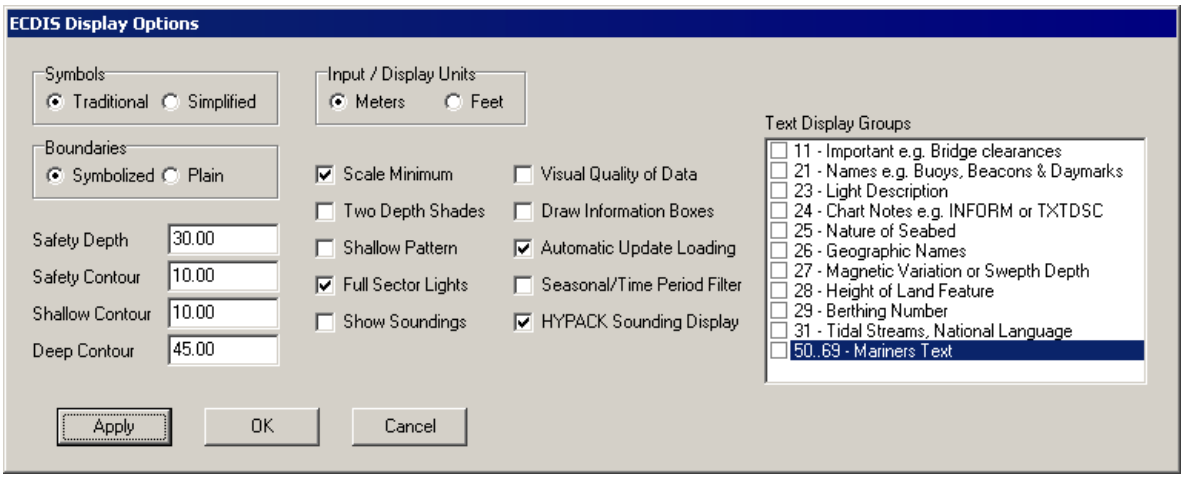
2. **Check the layers/levels you want to display.**
3. **Preview your results** by clicking [Apply].
4. **When your display is satisfactory, click [OK]**.

DISPLAYING S57 CHARTS

S57 chart settings are accessed from the Charts tab of the HYPACK® control panel.

S57 Options: **[S57 Options]** in the displays the ECDIS Display Options dialog.

FIGURE 2-20. *S57 Options Dialog*



Symbols: Choose between Traditional and Simplified.

Boundaries: Choose to have them marked with symbols (Symbolized) or as plain lines (Plain).

Safety Depth displays depth labels in different colors above and below this depth.

Safety Contour, Shallow Contour and **Deep Contour** define different depth ranges which will be displayed with backgrounds of different shades of blue. Note: This option is overridden by the Two Depth Shades option.

Input/Display Units: The units of measure in which your depths will be displayed. It is also the unit in which you will work while in the ENC EDITOR. (You will enter chart soundings and all measurements in the selected units.)

NOTE: In the ENC EDITOR, sounding files imported to your chart are assumed to be in the units defined in your geodetic parameters. They are converted to the units indicated in your chart information and displayed according the units set in the S57 display options.

Scale Minimum displays different map features and symbols at varying zoom scales according to S57 standards. This option prevents your Map window from becoming overly cluttered. If this option is clear, everything will be displayed regardless of the zoom scale.

Two Depth Shades uses only two shades to display depths greater than and less than the Safety Contour.

Shallow Pattern draws a pattern in the areas of the map where the depth is shoaler than the safety contour.

Full Sector Lights includes data regarding direction and color of lights. If this is off, you will see only the position of the light source.

Show Soundings toggles the display of chart soundings.

Visual Quality of Data: S57 charts include markings that indicate whether the chart has been tested for accuracy and, if so, how accurate it is. Check this option to clear this 'clutter' from your display.

Draw Information Boxes: Draws S57 markers at all points of interest. Clearing this option will provide a less cluttered display.

Automatic Update Loading: When you load a base chart (typically *.000) and there are update charts (typically *.001, *.002…) in the same folder, checking this option loads all related chart information to provide the most updated display.

Seasonal/Time Period Filter: Object attributes may specify time ranges when they would be most applicable to display. Check this option to display only objects whose attributes match the current time.

HYPACK® Soundings Display: When 'Show Soundings' is checked, this option toggles between ECDIS display and HYPACK® display options.

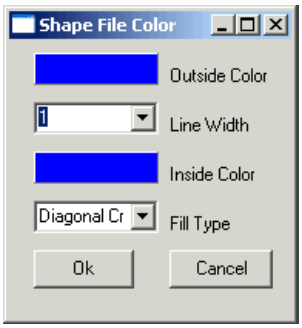
Text Display Groups: Charts can get cluttered with excessive text. Select only those text features you want to see in your chart display.

DISPLAYING SHP CHARTS

These line and polyline shape files (*.SHP) available from ArcView and ArcInfo. HYPACK® currently only supports drawing the main chart file, which defines points, lines and areas. (There are no attributes drawn.) In HYPACK®, you can enhance the chart display by assigning colors and textures and line weights.

1. **Load the chart to your project** as you would most background files.
2. **Right-click the file name in the Project Files list and select "Edit Colors".** The Shape File Editor will appear.

FIGURE 2-21. *Shape File Editor*



- **Outside Color** and **Line Width** affect the lines that define line and area objects in the chart.
- **Inside Color** and **Fill Type** affect the interior of area objects.

3. **Modify colors** by clicking the current color block and select a color from the selection dialog that appears.
4. **Select Line Width and Fill Type** from the drop-down lists.
5. **Click [OK]**.

Creating Geo-referenced TIF Charts in HYPACK®

HYPACK® includes utilities that enable you to generate geo-referenced TIF images that you can then load to your project as background charts.

Generate TIF charts from your current HYPACK® map display using the TIF CAPTURE tool. You can use the resulting chart in HYPACK® or export it to display in other software packages.

Generate TIF charts from any TIF, BMP or JPG image using the IMAGE GEOREFERENCE routine. This option enables you to georeference images, such as satellite images or snapshots taken from a plane, and display it as a chart in your project.

More Information

- "Creating Geo-referenced TIF Files in Mosaic Mode" on page 5-39
- "Exporting Geo-Referenced TIF Files from TIN Model" on page 7-146
- "Loading Project Files to Guide your S57 Feature Drawing" on page 7-208
- "Exporting Geo-Referenced TIF Files from Cloud" on page 8-225

Exporting Geo-referenced TIFs of your HYPACK® Display

HYPACK® enables you to create a geo-referenced TIF file from your HYPACK® display or a portion of it. It will include everything that appears within user-defined boundaries, ready to display as a background chart in your project.

We define the boundaries of the area to be captured by entering the coordinates of the bottom-left corner and the dimensions of the area in survey units. You can do this with either of two methods:

- Manually enter the information to the TIF Output dialog.
- Load a matrix file that borders the capture area.

To capture a TIF from your area map:

1. **Enable all HYPACK® features** to be included in your TIF.

2. **If you are using a matrix to position and size the TIF**, create it in the MATRIX EDITOR. To assure that your data will be fully included in the TIF:
   - Size and position the Matrix over your data and
   - Set the rotation to zero.

FIGURE 2-22. *Creating the Matrix (Background File disabled to display matrix more clearly.)*

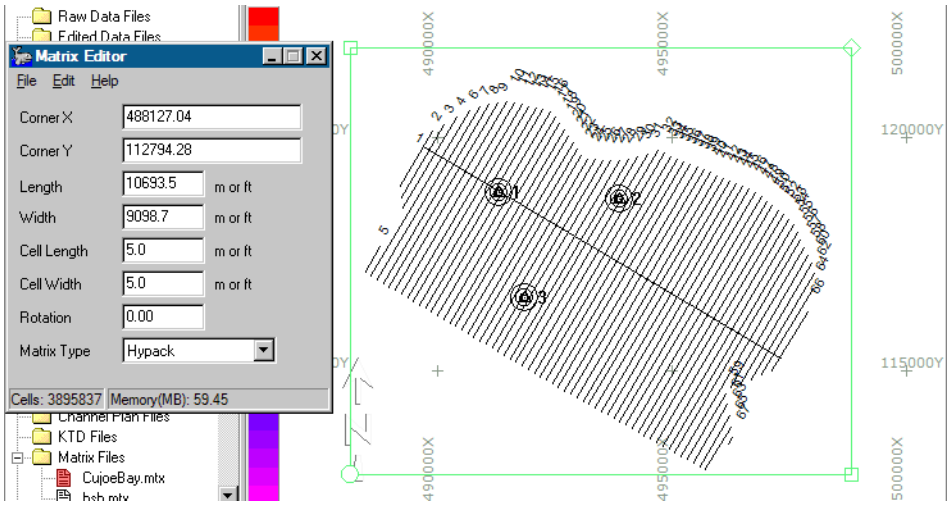
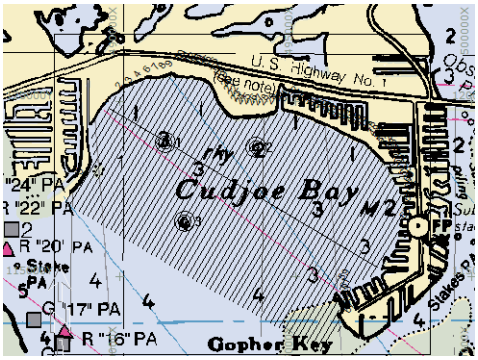
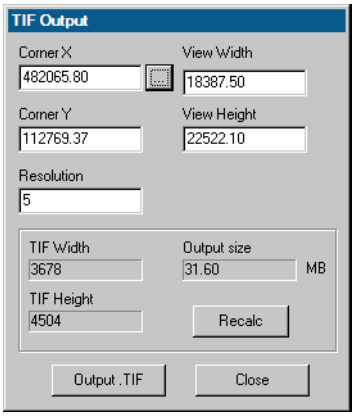


FIGURE 2-23. *Add the BSB chart behind the HYPACK® features.*



3. **Click the 'Capture Tif Image' icon on the Screen Control bar**
4. **Drag the capture area in the area map.** The TIF Output dialog will appear with the size and location of your defined area.

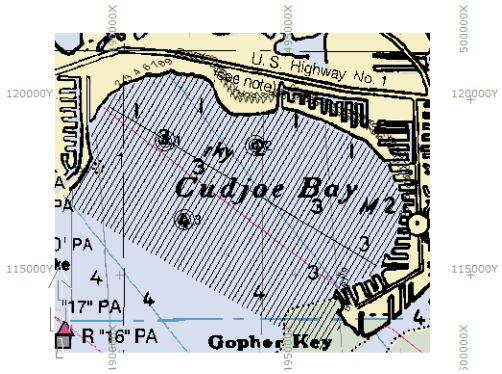
FIGURE 2-24. TIF Output dialog



NOTE: If you are using a matrix to define your capture area, the data will be replaced when you load the matrix.

5. **Modify the corner point and image dimensions** (Optional).
   - Manually enter this data in survey units or
   - Click [Load Limits] and select the matrix on which the size and position of the TIF will be based. The CornerX, CornerY, View Height and Width will update according to the matrix properties.
6. **Define the resolution.** The default value is 5 and the output TIF size will be calculated and displayed at the bottom of the dialog. Smaller resolutions result in larger output size. It is up to you to decide what resolution best balances file size and resolution to suit your needs. Adjust the resolution and click [Recalc] to determine the image size until your are satisfied.
7. **Click [Output Tif].** The TIF and TFW files will be created and saved, by default to the project directory.
8. **Click [Close]** to return to the HYPACK® screen.
9. **Load the TIF to your project** as you would most other background charts.

FIGURE 2-25. The resulting TIF



CONVERTING IMAGE FILES TO GEO-REFERENCED TIFS

The IMAGE GEOREFERENCE routine is used to convert image files to geo-referenced TIF images that can be used as background charts in HYPACK® and SURVEY. You can also load them to the ENC EDITOR to be used as a guide for building an S57 chart of your project area.

You will need the following:

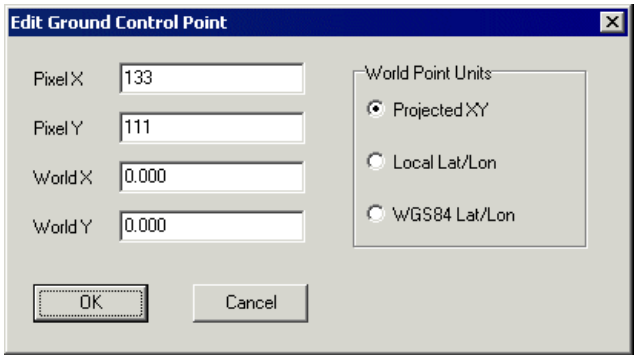
- **The image files** can be from anywhere: screen captures of other chart types, satellite photos or aerial fly-over shots. The tool accepts TIF, BMP or JPG. (If your image is of a different file type, it can easily be converted in most graphic programs.)
- **The positions of at least two distinct features in your image.** These positions, called 'ground control points', are used to calculate the correct position, rotation and scale of your image file. For greater accuracy, use more than two points and space them as far apart as you can.

When you have your image and ground control points, you are ready to geo-reference your image.

1. **Launch the IMAGE GEOREFERENCE routine** by selecting PREPARATION-EDITORS-IMAGE GEOREFERENCE.
2. **Load your image file**.
   a. **Select IMAGE-LOAD**.
   b. **Set the file type** to match your image file type.
   c. **Select your image file and click [Open]**.

   The image will be drawn to the IMAGE GEOREFERENCE window.
3. **Define your ground control points (GCP)**.
   a. **With the default cursor, double-click on the image at the first known position.** A red symbol will appear on the image and a dialog will appear.

FIGURE 2-26. *Defining Ground Control Points*



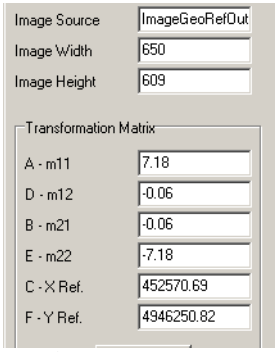
   b. **Select the format in which you want to enter your GCP positions.**

c. **Enter the position information** under 'World X' and 'World Y' and Click [OK].

d. **Repeat for your additional reference points**.

4. **Calculate the rotation and scale of your image** to fit the world coordinates of your ground control points.
   - **If you have only two GCP positions,** click [2PT Transformation].
   - **For three or more GCP positions,** click [3+ PT Rectification].

FIGURE 2-27. *The Image Information shows the calculated scale and position values.*



5. **Apply the calculated scale and rotation to the image.** Click [Apply].

TIP: Check the Map Display option to preview the geo-referenced image in the HYPACK® map display. Red markers show the positions of the control points so you can verify their accuracy.

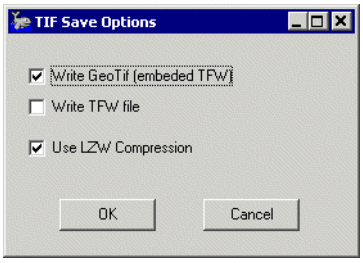
6. **If there are features behind the TIF, you can adjust the transparency of the image preview.** (Optional)
   a. **Click [Transparency]** to access the Transparency dialog.
   b. **Choose the level of transparency** using the slider.
   c. **If you have checked the Map Display option, click [Apply]** to see the results in the HYPACK® map.

   NOTE: This is for preview purposes only. The TIF will be saved with 100% opacity. You can set its transparency in your HYPACK® display through the 'Transparency' option when you right-click on the chart name in the Project Files list.

   d. **Return to the Image GeoReference dialog** by clicking [OK].

7. **Save the results as a geo-referenced TIF image.**
   a. **Select IMAGE-SAVE**. The TIF Save Options dialog will appear.

FIGURE 2-28. TIF Save Options



b. **Select your options and click [OK].**

- **Write GeoTif** (embedded TFW).
- **Write TFW** file enables you to generate a separate file that contains coordinates that describe the location, scale, and rotation of the TIF. It is used by geographic information systems (GIS) software for locating areas in raster map images.
- **Use LZW Compression**: This is a lossless compression algorithm that significantly reduces the resulting file size without losing resolution of the image.

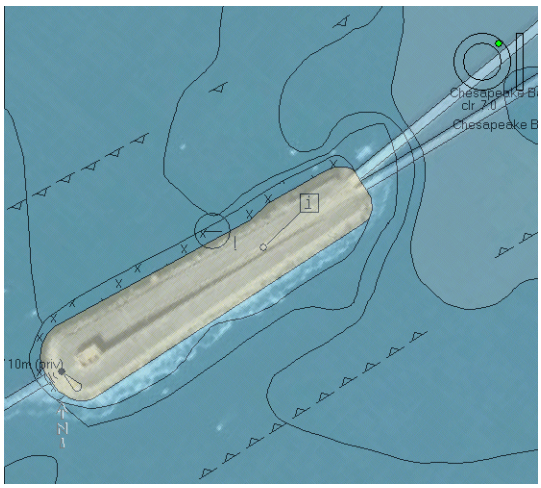
8. **Load the new chart to HYPACK®.**

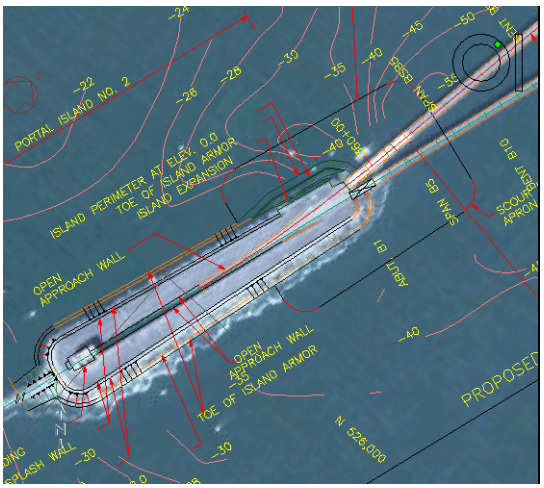
TIP: You can verify the accuracy of the chart positioning by checking the 'Draw Image' option in the Image Geo-referenceing Tool. This displays the calibration points in the HYPACK® Map window where you can compare their position on your grid.

9. **Modify the HYPACK® chart drawing order and tranparencies, if necessary,** to optimize the view of all objects in your map window.

   The following figure shows a geo-referenced satellite photograph of a segment of the Chesapeake Bay Bridge-Tunnel displayed with S57 and DWG files.

FIGURE 2-29. Sample TIF Displays in HYPACK®





More Information

- "Setting Chart Display Order" on page 1-42
- "Setting Chart Transparency" on page 1-41

CREATING CHARTS IN THE DG2 EDITOR

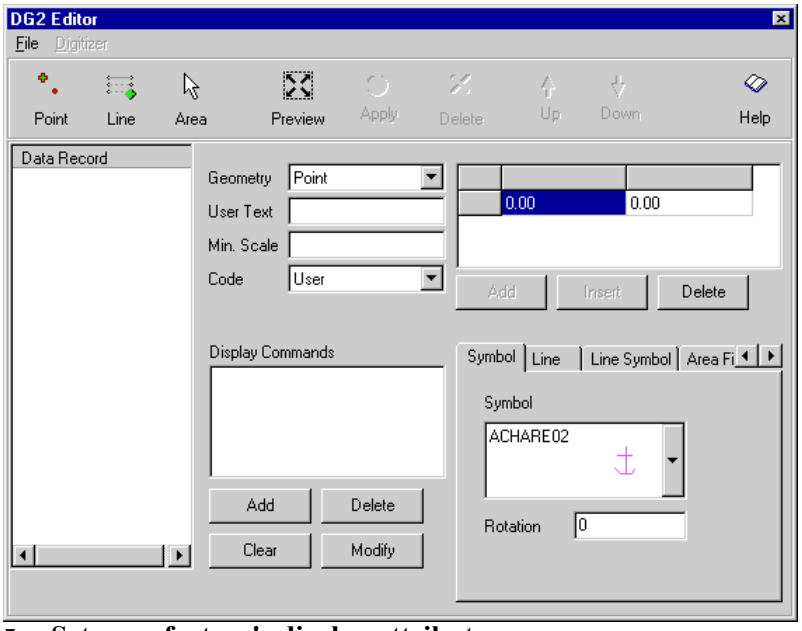
The DG2 EDITOR is a simple tool to create a custom, digitized background file using your cursor right in HYPACK®. The DG2 EDITOR includes a large selection of point, line and area objects that you can include in your chart which is saved, by default, to your project directory with a DG2 extension.

RUNNING THE DG2 EDITOR

The general process is simple, but the range of possibilities the editor offers requires a little thought. The following procedure outlines the general procedure. More detailed descriptions are provided in the following sections.

1. **Set your geodesy for your project location**. If your geodesy settings are not correct for your location, the editor can not position your chart accurately.
2. **Load existing background files,** if you have them, to help guide positioning the new features. Otherwise, you will need some idea of the XY positioning for your features.
3. **Center your area map** over the project area.
4. **Launch the DG2 Editor** by selecting UTILITIES-DIGITIZING PROGRAMS-DG2 EDITOR. The DG2 EDITOR dialog will appear.

FIGURE 2-30. *DG2 Editor*



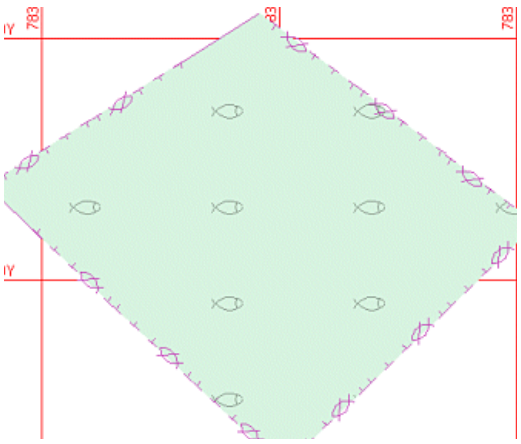
5. **Set your feature's display attributes**.
6. **Enter the S57 Options**. These are options common to S57 charts. The Geometry setting must match the feature type you are creating. The remaining S57 Options are optional.
7. **Position the feature(s) in your chart.** Once the feature attributes are set, you can create one or more like objects by repeating this step multiple times.
8. **Preview your work (Optional)** by clicking the Preview icon. The DG2 EDITOR will minimize to a button at the lower left of your HYPACK® screen and the area map will zoom in to your chart. Return to the DG2 EDITOR by clicking the button.
9. **Continue to define objects, attributes and position information** until you have created all of the features you want in your chart.

NOTE: You can remove any feature by selecting it in the Data Record and clicking the Delete button.

---

10. **Save your chart** by selecting FILE-SAVE and naming your file. Your file will be saved, by default, to your project directory with a DG2 extension.

FIGURE 2-31. *DG2 Chart with border, fill and pattern in the HYPACK® Area Map*



More Information

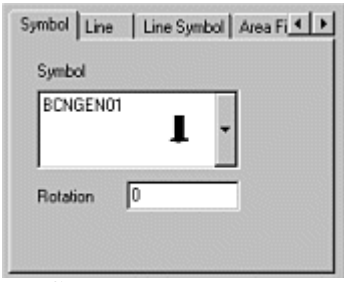
- "Entering your Geodetic Parameters" on page 2-44
- "Loading Background Charts to the Project" on page 2-4

SETTING DISPLAY ATTRIBUTES IN THE DG2 EDITOR

Display Attributes are all included in the tabbed area in the lower right of the dialog. They describe everything about how a feature will appear in the chart. Your task is to select those that describe your chart feature.

Attributes are grouped according to the feature type and attribute type in the tabbed area to the lower right of the dialog. (Use the left and right arrows to scroll through the tabs.) You may apply attributes from more than one tab, but only those that apply to your feature type. For example, you can not apply an area feature attribute to a point feature.

FIGURE 2-32. *Attributes Lists*



1. **Select a tab that corresponds to your feature type**.
2. **Select a display attribute** from the tab for your chart feature. Keep in mind that attributes will be drawn *in the order defined*. If you are adding multiple attributes, you may need to think about the draw order required to make all attributes visible. In the previous example, the area fill is added first so the pattern and border symbols are drawn

on top. If the area fill is opaque and drawn last, the other attributes will not be visible.

Notes: Text attributes are only applicable to point features.

If your line weight is greater than 1, the line style will always be solid.

---

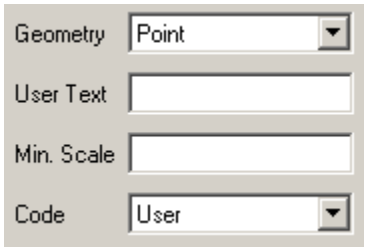
3. **Click [Add].** The display command will appear in the Display Commands area.
4. **Repeat steps 2 and 3 for each attribute** to be applied to the feature. You may include as many attributes as you need to describe your object.
5. When all attributes are described, **click the Apply icon**.

S57 Options in the DG2 EDITOR

With the exception of the Geometry, the S57 options are optional.

Geometry must match the feature type you are creating. The rest of the options in this group are still under development, but you can add this information in your chart data to be ready for future use.

FIGURE 2-33. *S57 Options in the DG2 Editor*



Geometry types include:

- **Point Features**: Objects that are positioned at one point. These would include such objects as buoys or beacons.
- **Line Features**: Objects described by a polylines. These might include objects such as pipe lines or roads.
- **Area Features** are described by closed polygons. These might include objects such as land areas or depth areas.

User Text will label the point feature in your chart.

Minimum Scale is the zoom scale at which the feature will appear. It will be hidden when HYPACK® is zoomed out to a scale than you have specified.

Code is the S-57 code appropriate to the feature you are creating.

DEFINING FEATURE POSITION IN THE DG2 EDITOR

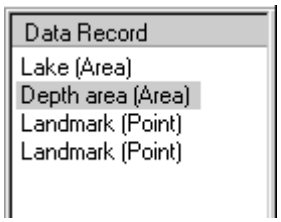
Even though you have a physical description of your feature, there is still no information to position it in your chart. Positioning is initially done using your cursor. You can position points more precisely by modifying the coordinate list in the dialog.

1. **Select your feature type** by clicking the corresponding icon on the tool bar. The dialog will display a smaller editing tool bar that covers less of your area map.

FIGURE 2-34. *Editing Toolbar*

2. **Enter the positioning information.** This can be done by using the cursor, by typing it to a spreadsheet or by importing a coordinate file. Depending on the selected feature type, multiple coordinate pairs will create one point object for each coordinate pair, a line that connects each location, or an area defined by the locations indicated
   - **To use your cursor:** Mark the location(s) on the HYPACK® area map where the selected feature occurs and click the Finish icon.
   - **To use the spreadsheet:**, Use [Add] to append enough rows to the spreadsheet for each point needed to describe your feature. When you are finished, click [Apply].
   - **To import coordinates:** Select FILE-IMPORT and select an XY, XYZ file.
3. **Click the Finish icon** to return to the full dialog. You will see the object recorded in the Data Record list and the coordinates of the points you defined with the cursor listed in the upper right. The feature will be visible in the HYPACK® area map behind the editor dialog.

FIGURE 2-35. *Data Record List*



More Information

- “Importing Data to the DG2 EDITOR” on page 2-32

IMPORTING DATA TO THE DG2 EDITOR

The DG2 Editor enables you to import data from DG2, DGW and DIG chart files, as well as XY or XYZ coordinate files.

Importing a Chart File to the DG2 Editor

When you import a chart file, the program enters the chart information into the DG2 EDITOR. It enters all coordinates and assigns all features to corresponding point, line and area features in the DG2 format.

To import chart files:

1. Select FILE-IMPORT.
2. Select the chart file you wish to import and click Open.
3. Save your DG2 chart by selecting FILE-SAVE or FILE-SAVE AS and naming your file.

Importing a Coordinate File to the DG2 Editor

You can import a list of coordinates to the DG2 Editor to provide position information for chart features. Coordinates may be in Local XY, Local Lat/Lon or WGS-84 Lat/Lon.. Lat/Lon may be expressed in any format. Use negative values to designate Southern and Western positions.

When you import coordinate files, the program enters the coordinates to the DG2 EDITOR then presents a dialog where you instruct the program how to read the coordinates and what type of object or objects to create from them. Choose from point , line or area objects. Once the positions are established, you must assign the display attributes for each feature generated by the import..

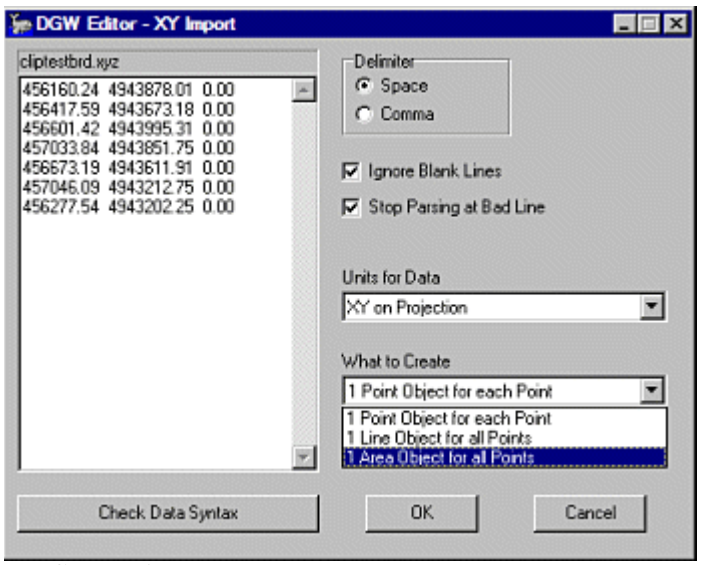
To import XY or XYZ files:

1. **If your import file describes a single file, or multiple like point objects,** set your display attributes.

   NOTE: This can be a real time saver if you need to create several point objects *with the same attributes*.

2. **Select FILE-IMPORT**. A File Select dialog will appear.
3. **Set the File of Type field to XY or XYZ**, then select the coordinate file to be read and click [Open]. The data will be read and listed in the XY Import dialog.

FIGURE 2-36. Importing an XYZ Data File



4. **Set the import parameters**.
   - **Delimiter** tells the program whether a comma or space separates coordinates.
   - **Ignore Blank Lines**: If the file contains a line with no coordinates, the program will simply advance to the next line and continue.
   - **Stop Parsing at Bad Line** aborts loading the coordinates if any of the lines in the file fail to conform to a format the program can read.

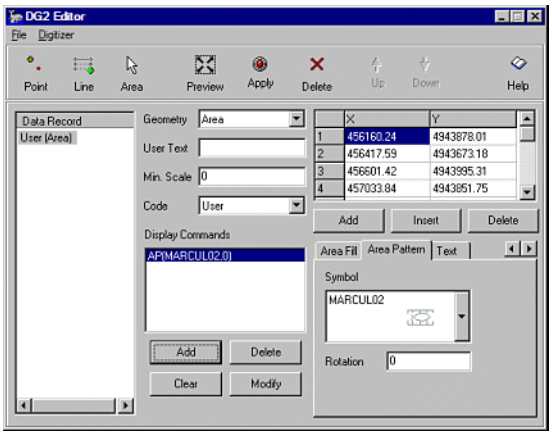
Check this option and click [Check Data Syntax]. If a line is bad, it will be highlighted when the message appears with the number of valid lines.

   - **Units for Data**: Describes the format for the data file.
     - XY on Projection
     - Local Lat/Lon
     - WGS84 Lat/Lon

     NOTE: Lat/Lon may be in any format, *however* if you use a format with spaces in it, you *must* use a comma delimiter.

   - **What to Create** tells the program whether the coordinates describe a series of point objects, a line or an area.
5. **Verify your file will be read by clicking [Check Data Syntax].** The program will read your file according to the parameters entered. The program will display the number of valid lines and it can read with the total number of lines.
   - If this is correct, proceed to the next step.
   - If this is not correct, recheck your source file.
6. **Click [OK].** The objects will be generated according to your settings. In this example, an area object was created by the import.

FIGURE 2-37. *Setting Feature Attributes*



7. **If you have generated features without attributes, set the attributes for each feature as follows:**
   a. Select the imported feature under Data Record.
   b. Set the display attributes.
   c. Click the Apply Icon.

MODIFYING FEATURES IN THE DG2 EDITOR

At any time, you can load a DG2 chart to the program and modify its features. Changes for each feature must be applied in the chart by clicking the [Apply] button to record the changes.

To modify the feature position:

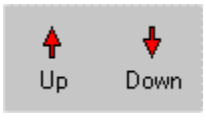
1. **Select the feature in the Data Record**.
2. **Edit the positioning** information.
3. **Click [Apply]**.
4. **Save your file**.

To modify the display attributes:

1. **Select the feature in the Data Record**.
2. **Select the display attribute** you want to change in the Display Commands list.
3. **Make your new selection(s) in the attribute tabs**.
4. **Click [Apply].** Features are initially listed in the Data Record in the order they are created. This list also controls their draw order in the chart. If you create features in an order that causes a feature to be hidden behind another, you can rearrange the draw order to optimize your display.

To modify feature draw order:

1. **Select the feature in the Data Rec**ord whose position you want to change.
2. **Use the up and down arrow icons** in the tool bar to relocate the feature in the draw order.



To delete a feature:

1. **Select the feature in the Data Record**.
2. **Click the Delete icon** on the tool bar.

To delete an attribute:

1. **Select the display attribute you want to delete.**
2. **Click [Delete]** below the Display Commands list.

MERGING DG2 CHARTS

You can merge the chart data from multiple DG2 charts by importing one to another.

When you merge two charts in this way, there's a good chance that the draw order of the features will need to be modified, moving large opaque features to the top of the Data Record so that they are drawn before smaller features which would, otherwise be covered.

1. **Open your first DG2 chart** in the DG2 EDITOR by selecting FILE-OPEN and selecting your first chart.
2. **Select FILE-IMPORT and select the file you want to add**. The imported chart features will be appended to the Data Record.
3. **Modify the draw order**, if necessary, to display all chart features.
4. **Save your file.** Select FILE-SAVE to overwrite the original DG2 file, or FILE-SAVE AS to save the combined file to a new file name.

EXAMPLE OF CREATING A DG2 CHART

You've just been out fishing and you've discovered an area particularly plentiful with fish. It was between the rocks at the west end of the lake and the tree you used to swing from as a child. Make a chart called Great_Fishing.DG2 to help you find it again.

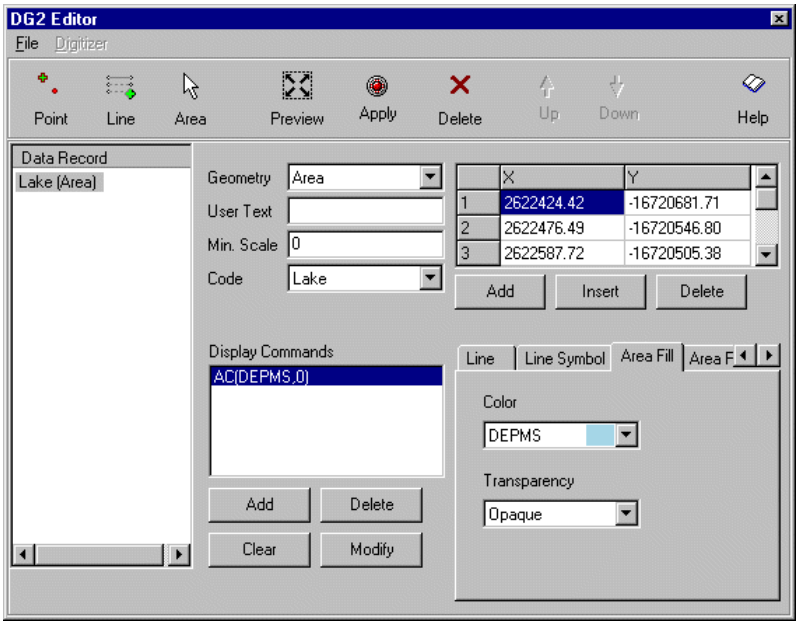
Let's make a mental list of the features and attributes you should include.

Feature	Feature Type	Attributes
Lake	Area	Solid opaque light blue fill
Tree	Point	Trepnt05 Symbol "Tree Swing" Label
Rocks	Point	Cairns01 "Rocks" Label
Fishing Area	Area	Red border Yellow fill 3 points wide FSHHAV02 pattern

1. **Check your geodesy** settings and zoom to the general location of your lake.

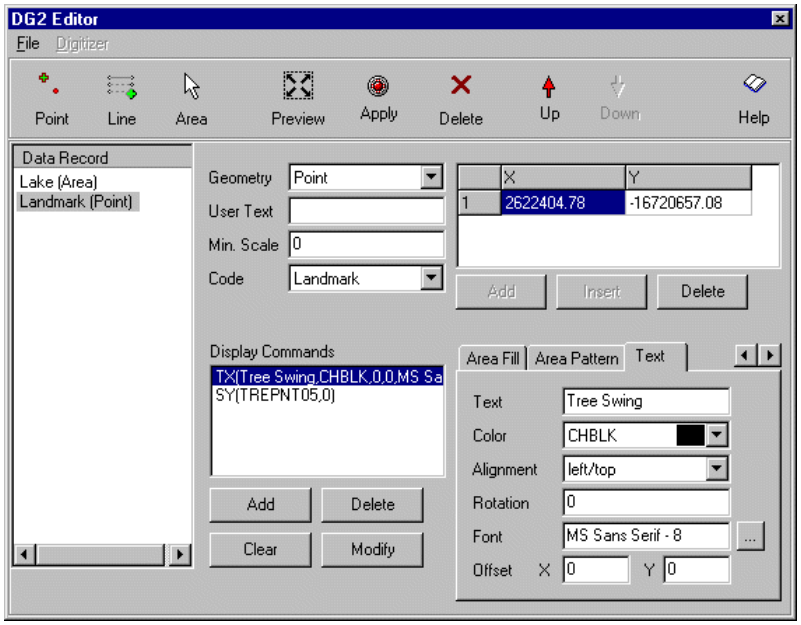
2. **Open the DG2 EDITOR**.
3. **Create the lake**.
   a. Select the Area Fill attribute tab.
   b. Select the DEPMS color and Opaque transparency attributes.
   c. Click [Add].
   d. Change the Geometry option to "Area".
   e. Set the Code option to "Lake".
   f. Click the Area icon. The DG2 EDITOR will minimize.
   g. Use your cursor to outline the lake by clicking in your area map.
   h. Click the Finish icon.

FIGURE 2-38. *Lake Settings*



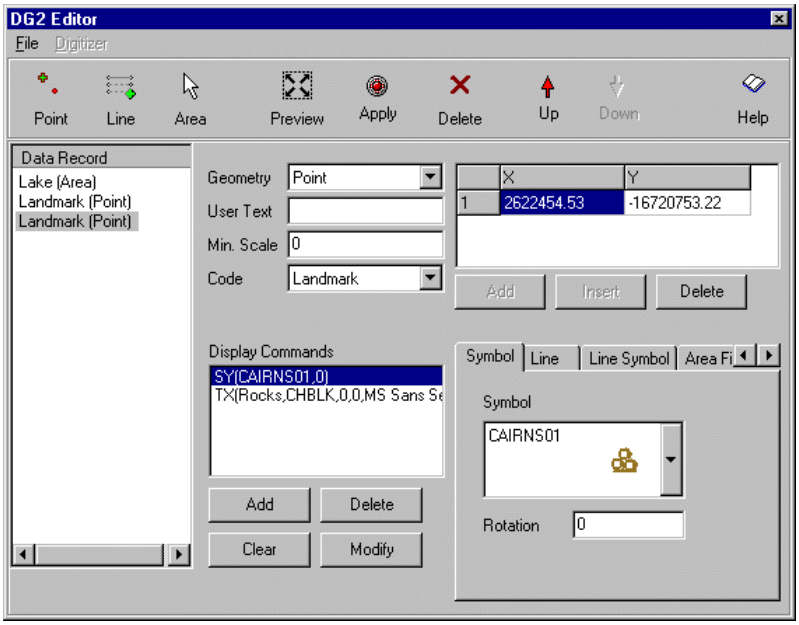
4. **Mark the tree**.
   a. Click [Clear] to begin a new set of attributes.
   b. Select the Symbol attribute tab, choose the Trepnt05 symbol and click [Add].
   c. Select the Text attribute tab, type "Tree Swing" in the Text field and click [Add].
   d. Change the Geometry option to "Point".
   e. Set the Code to "Landmark".
   f. Click the Point icon. The DG2 EDITOR will minimize.
   g. Use your cursor to mark the tree's position.
   h. Click the Finish icon.

FIGURE 2-39. *Tree Settings*



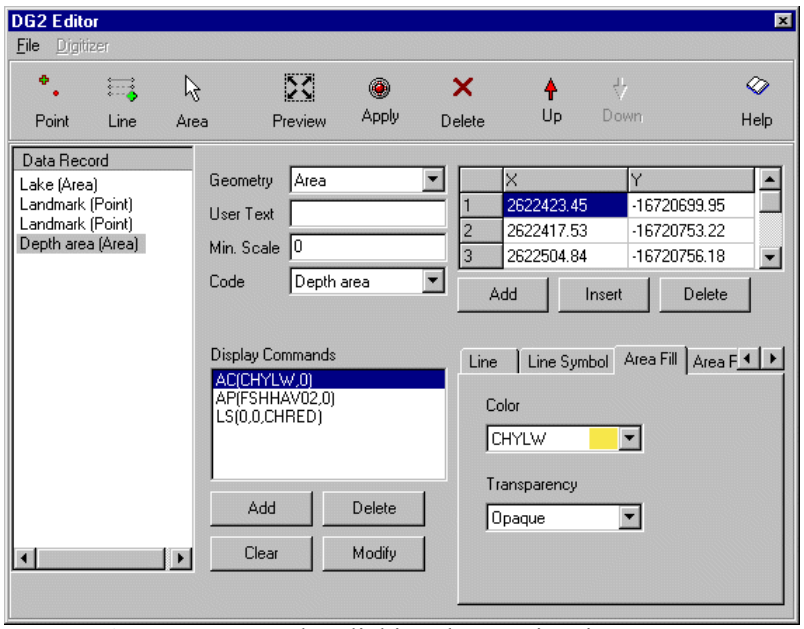
5. **Mark the rocks**.
   a. Click [Clear] to begin a new set of attributes.
   b. Select the Symbol attribute tab, choose the Cairn01 symbol and click [Add].
   c. Select the Text attribute tab, type "Rocks" in the Text field and click [Add].
   d. Change the Geometry option to "Point".
   e. Set the Code to "Landmark".
   f. Click the Point icon. The DG2 EDITOR will minimize.
   g. Use your cursor to mark the rock's position in the water.
   h. Click the Finish icon.

FIGURE 2-40. *Rock Settings*



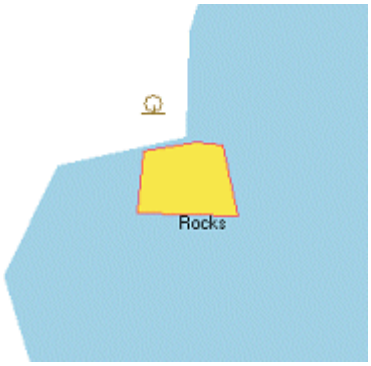
6. **Draw an area that borders your fishing spot.**
   a. Click [Clear] to begin a new set of attributes.
   b. Select the Area Fill attribute tab, choose the CHYLW color and 50% transparency attributes, and click [Add].
   c. Select the Line attribute tab, Choose style A, width 3 and color CHRED, and click [Add].
   d. Select the Area Pattern tab, choose the FSHHAV02 pattern, and click [Add].
   e. Change the Geometry option to "Area".
   f. Set the Code to "Depth Area".
   g. Click the Area icon. The DG2 EDITOR will minimize.
   h. Use your cursor to outline the fishing area by clicking in your area map.
   i. Click the Finish icon.

FIGURE 2-41. *Fishing Hole*



7. **Preview your chart** by clicking the Preview icon.

FIGURE 2-42. *Chart Preview*



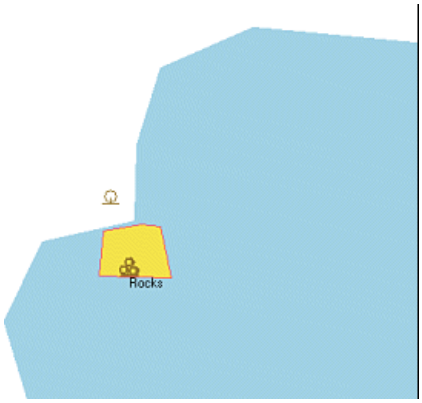
Notice that the Cairn symbol is hidden. This is because the opaque fill of the fishing hole area is drawn after the rocks. This could have been avoided if we had created the fishing hole area before the rocks.

NOTE: The fish pattern is widely spaced. It was not visible until we zoomed in to make the fishing hole area large enough on screen to see the pattern.

8. **Reorder features** to show rocks.
   a. Return to the DG2 EDITOR.
   b. Select the Fishing Hole in the Data Record.
   c. Use the up arrow to move the fishing hole up 1 or 2 positions. It must be after the lake area in order to be visible in front of the lake.

FIGURE 2-43. *Modifying the draw order in the DG2 Editor*

FIGURE 2-44. *Final draw order (above) and the results (right)*



9. **Save your file.** Select FILE-SAVE and name it Great_Fishing. It will be saved, by default to your project directory.

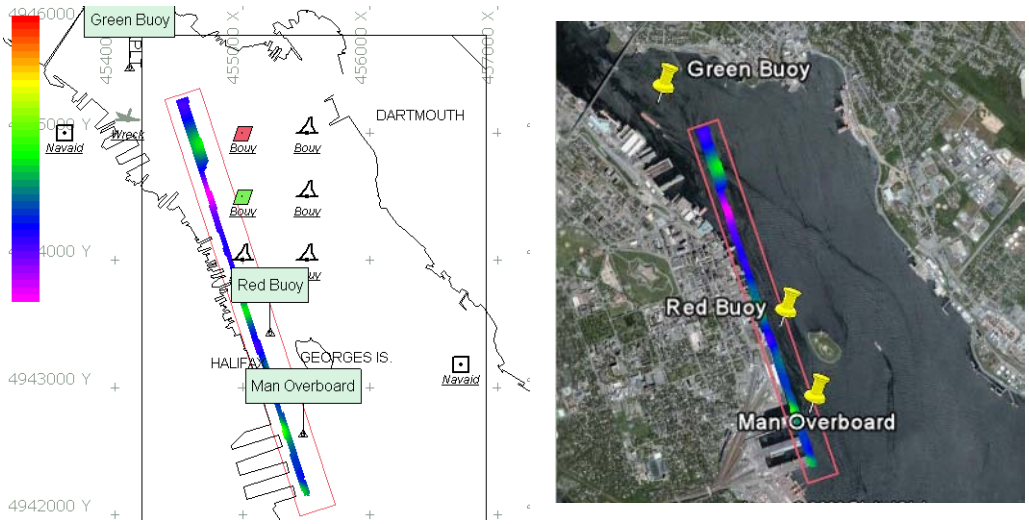
EXPORTING MAP FEATURES TO GOOGLE EARTH™

You can export select HYPACK® file types to a Google Earth™ KML file, which you can then open in the Google Earth™ program and view them overlaid in the display.

The following file types are supported by this feature:

- XYZ
- track lines
- targets
- DXF contours and hatch
- matrix
- planned lines

FIGURE 2-45. *Filled Matrix and Targets from Hypack to Google Earth™ HYPACK® input (left) and Google Earth™ Output (right)*



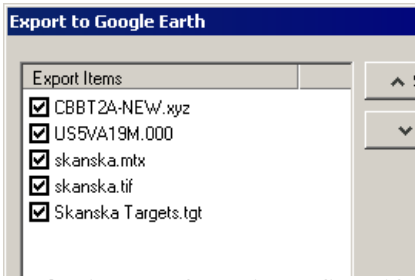
KML files can be generated from the HYPACK® Files list or from the EXPORT program.

Exporting KML from HYPACK®

To export a KML file from HYPACK®:

1. **Right-click in the Project Files or Data Files area and select 'Export Google Earth™'**. A dialog will appear listing all project files that are available for export
2. **Select the files to export to Google Earth™ and click [Export].** The Export to Google Earth™ dialog will appear listing all enabled files in their current draw order.

FIGURE 2-46. *Export to Google Earth™ Dialog*



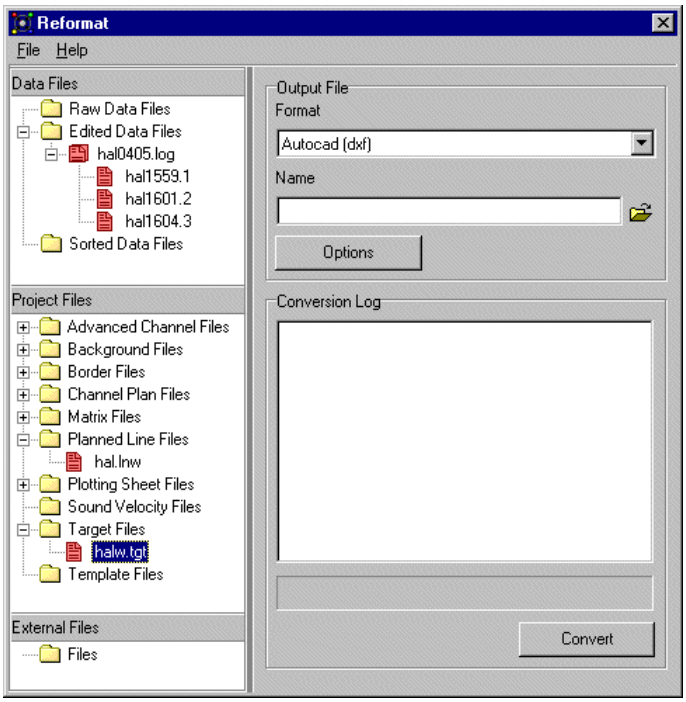
3. **Omit any of the listed files, if necessary,** by clearing their check boxes.
4. **Reorder the draw order, if necessary.** Select a file in the list and move it up to draw sooner or down to draw later (on top) using the corresponding buttons.
5. **Click [Export]** and name your file in the File Save dialog. It will be saved, by default, to the project directory with the KML extension.
6. **When you are finished exporting, return to the** HYPACK® **window,** click [Close].

Exporting KML from EXPORT

EXPORT includes the KML Output File Format. No output options are required.

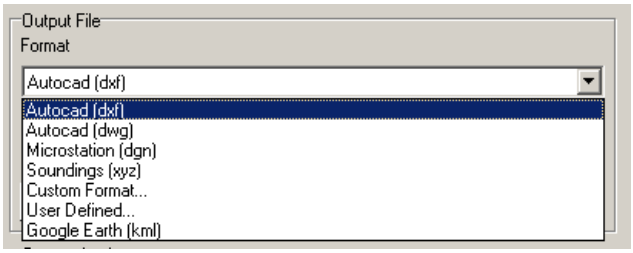
1. **Start the EXPORT program** by selecting FINAL PRODUCTS-EXPORT. All files associated with the project are loaded in their current enabled or disabled state to the EXPORT interface.

FIGURE 2-47. *The Main Window of the EXPORT Program*



2. **Select the Output file type** to which you want to export from the Output File Format drop-down menu.

FIGURE 2-48. *Selecting the Target Format*

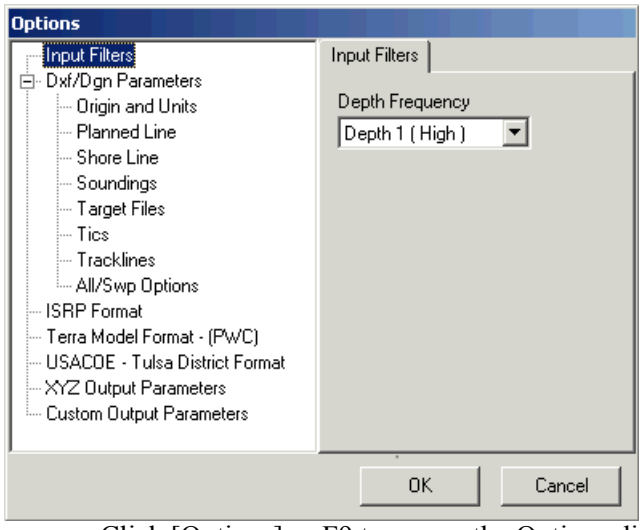


3. **Click the File Open icon and name your output file.** The path will default, in most cases, to your project directory. XYZ output formats default to the Sort directory.
4. **Select the file or files you want to convert** by enabling and disabling them in the file tree on the left side of the window as you would in the main HYPACK® screen. Files of types that can not be converted to the designated output format are marked with X's.
5. **Add External files (optional).** These are files that were not part of your project when you started EXPORT TO CAD, but you want to

add them to your exported project data. Select FILES-ADD FILES or right click on the Files folder in the External Files list and select "Add File(s)". A File Selection Dialog will appear for you to browse for additional files.

6. **Set your Input and Output Options**.

FIGURE 2-49. *Export Options Dialog*



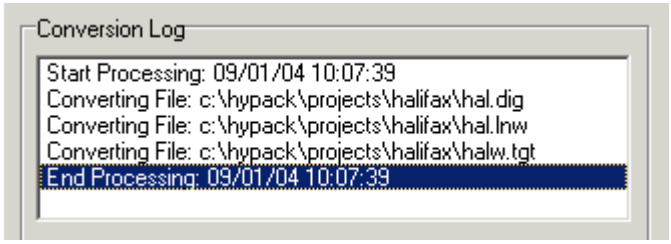
a. Click [Options] or F9 to access the Options dialog.

b. For each option applicable to your output file type on the left, select the option and set the related options displayed on the right.

c. Click [OK].

7. **When your list is complete and all parameters have been set, click on [Convert]** (or select FILE-CONVERT). The conversion will be made and you can see its progress in the conversion log which is displayed on the screen.

FIGURE 2-50. *Conversion Log*



NOTE: This will show which files have been successfully converted and if, for some reason, any have not.

GEODESY

Geodesy is the science of positioning objects on the earth's surface. Even though you don't need to be a "master of geodesy" to run HYPACK®, some basic geodetic knowledge can make the difference between obtaining a correct position and having your boat plot downtown.

Most GPS equipment outputs your position in WGS-84.

$\Phi\Lambda H_{wgs\text{-}84} \rightarrow \Phi\Lambda H_{Local\ Datum} \rightarrow XY_{Projection}$

In other words, HYPACK® receives the Latitude, Longitude and Height information based on the WGS-84 ellipsoid, and transforms it into a Latitude, Longitude and Height on the Local Datum. It then performs a "Grid Conversion" to calculate an X (Easting) and Y (Northing) on the specified projection.

ENTERING YOUR GEODETIC PARAMETERS

The **GEODETIC PARAMETERS** define your local grid. This enables HYPACK® to correctly calculate your XY position on your local grid from your GPS data (typically WGS84).

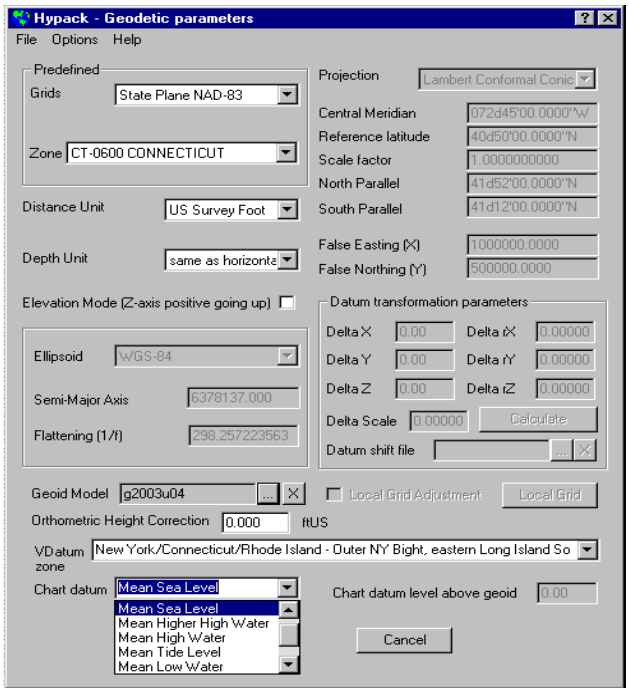
You must define the following geodetic parameters for your local grid.

- The reference ellipsoid
- Any necessary datum transformation parameters
- The projection parameters

The grid, zone, ellipsoid and survey units are displayed in the HYPACK® status bar above the area map.

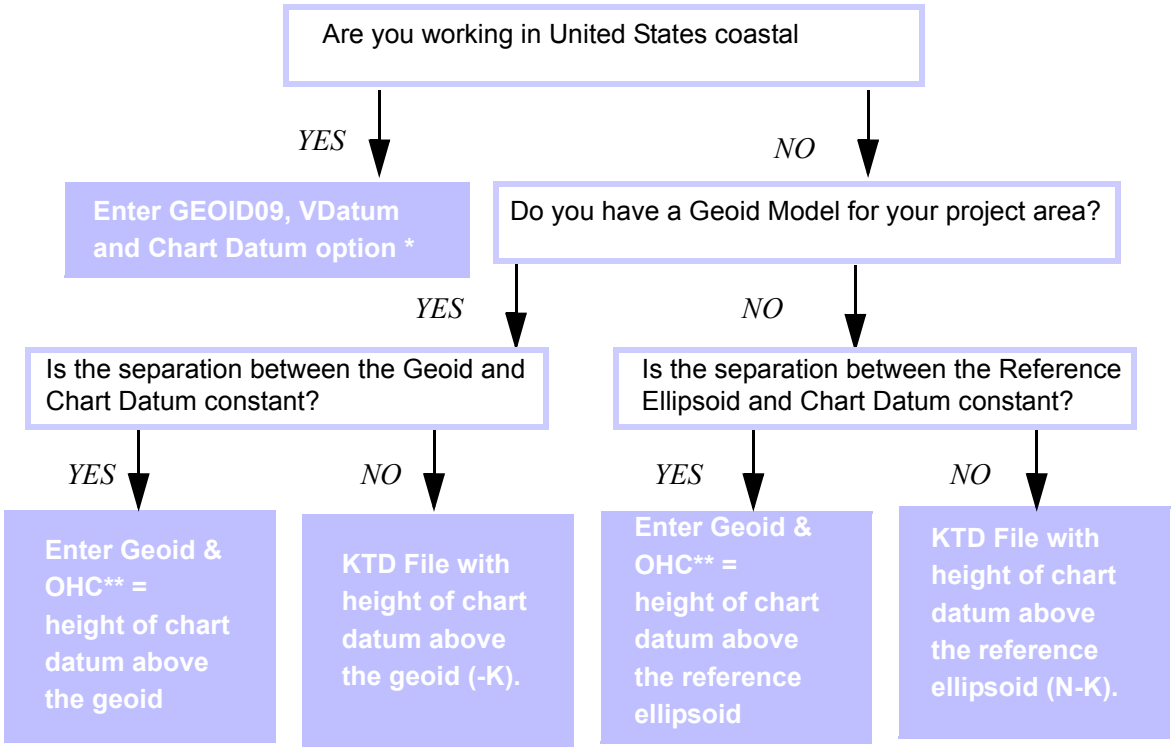
1. **Start the GEODETIC PARAMETERS program** by selecting PREPARATION-GEODETIC PARAMETERS.

FIGURE 2-1. *Geodetic Parameters Dialog*



2. **Select your Ellipsoids and Projection Parameters**.
3. **Select your Distance Units.** Notice that you can set your vertical and horizontal distances to be measured in different units if you wish. .
4. **If you are working in Elevation mode**:
   - Select the Elevation Mode option.
   - Enter a user-defined Chart Datum Level above Geoid. Your elevation is calculated by:
     Elev. = CDL–Raw Depth –Tide Correction–Draft Correction
5. **Set your Datum Transformation values**.
6. **Choose your Degrees Format.** Select OPTIONS-DEGREES FORMAT and the format you want to use.
7. **If you are logging RTK (Real-Time Kinematic) tides, set your vertical correction settings according to the following chart**:

FIGURE 2-2. *Configuring your Geodesy for RTK Tide Corrections*



* **When using the VDatum database**, *you must use one of the pre-defined chart datums*. If you enter a user-defined chart datum level, the VDatum database is ignored.

** **OHC**: Orthometric Height Correction in survey units. this value can be used to adjust HYPACK® so the tide values to match your tide gauge.

8. **Click [OK].** Your geodesy settings will automatically be saved to your project.

More Information

"Geoids" on page 10-78

SELECTING ELLIPSOIDS AND PROJECTION PARAMETERS

The lat/long/height that describes your position depends upon your mathematical model of the earth (your "Ellipsoid").

Many grids have been built into HYPACK®. Just select the correct grid and zone, and your projection parameters are automatically loaded.

If your survey requires a grid other than those in our predefined grids list, you can enter your own projection parameters.

GEODETIC PARAMETERS also supports local grid surveys.

More Information

- "Entering Datum Transformations Parameters" on page 2-51
- "Calculating Datum Transform Parameters" on page 2-58
- "Ellipsoids" on page 10-76

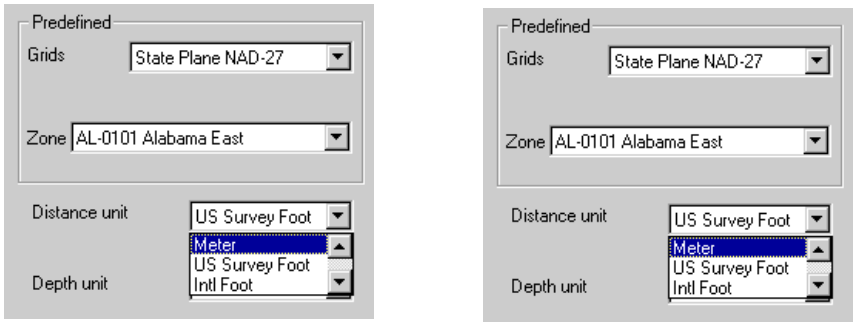
USING PREDEFINED GRIDS

Whether you're surveying in UTM, State Plane or some other grid, the procedure is the same.

To select a grid:

1. **Select your Grid from the Grids drop-down list**. The Zone choices will now relate to your grid choice.
2. **Select your survey zone.** The geodetic information for each zone is "hard-wired" in the code and will appear down the right-hand side.
3. **Select your survey distance unit** HYPACK® provides a choice several measurement methods.

FIGURE 2-3. *State Plane Metric Survey (left), US Survey Foot Survey (right)*



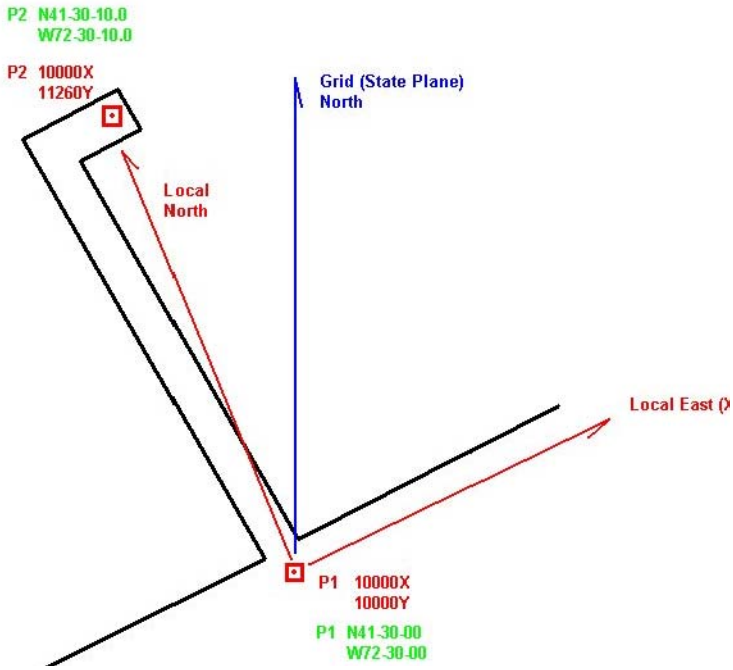
MANUAL GRID SELECTION

1. **Set the Grid List to None.** This will allow you access to all of the other features on the Geodetic Parameters window.
2. **Select your Ellipsoid from the choices in the ellipsoid drop-down box**. As soon as you make your selection, the Semi-Major Axis (a) and Flattening (1/f) values will change. If your ellipsoid is not in the list, click on the Other ellipsoid choice and manually enter the (a) and (1/f) values.
3. **Select your projection from the Projections list**.
4. **Select your survey Distance Units**.
5. The **Semi-Major Axis** and **Flattening, Scale Factor** and other geodetic information pertinent to your chosen projection should now be set. Different projections require different types of information. The labels and number of box entries down the left-hand side will change to reflect what the projection type you have selected needs.

LOCAL GRIDS

The "Local Grid" option in the GEODETIC PARAMETERS program enables you to position yourself on a local construction grid using your GPS equipment. To accomplish this, HYPACK® first takes the latitude/longitude from the GPS and converts it to an XY on one of the existing projections (e.g. State Plane 1983 or UTM). It then translates the projection coordinate to a local coordinate, using the information you supply in the "Local Grid" option box of the GEODETIC PARAMETERS program.

FIGURE 2-4. *Example of Local Grid Calculations*



An example would probably best illustrate how to go about this.

In this figure, you have two points P1 and P2. The coordinates on the local grid are as follows:

P1:	X = 10000.0	P2:	X = 10000.0
	Y = 10000.0		Y = 11260.0

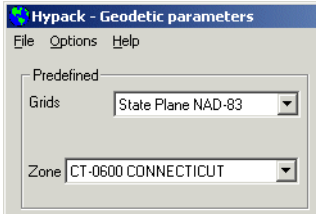
We have also performed a GPS survey on these points and found their WGS-84 (world) positions to be:

P1:	N41 – 30 – 00.0000	P2:	N41 – 30 – 10.0000
	W72 – 30 – 00.0000		W72 – 30 – 10.0000

Since we are in the State of Connecticut, we have decided to use the NAD-1983 CT State Plane Zone as our projection.

1. **Calculate State Plane coordinates for our P1 and P2**, using the WGS-84 Latitude and Longitude Information.
2. **Start the GEODETIC PARAMETERS program and set it for NAD-83 CT State Plane Zone**.

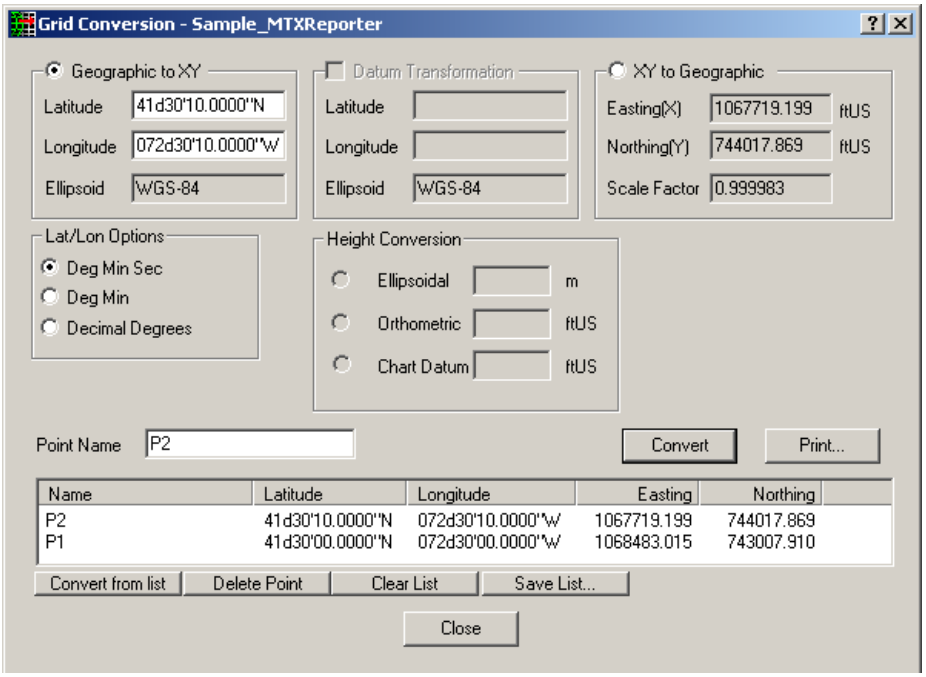
FIGURE 2-5. *Setting the Geodetic Parameters for your Local Grid*



3. **Convert both the P1 and P2 values to State Plane coordinates** in the GRID CONVERSION utility program. The resulting conversions provide us with the following information:

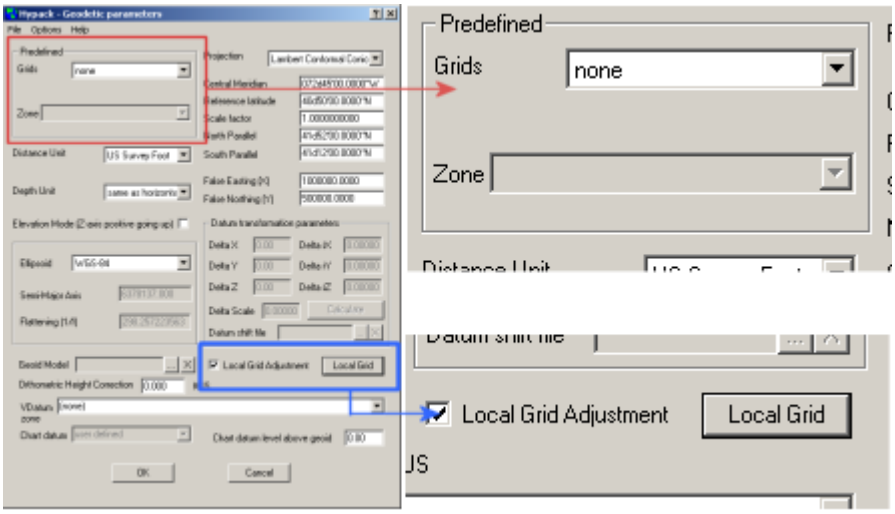
P1:	X = 1068483.01	P2:	X = 1067719.20
	Y = 743007.91		Y = 744017.87

FIGURE 2-6. *Converting the P1 and P2 values to State Plane Coordinates*



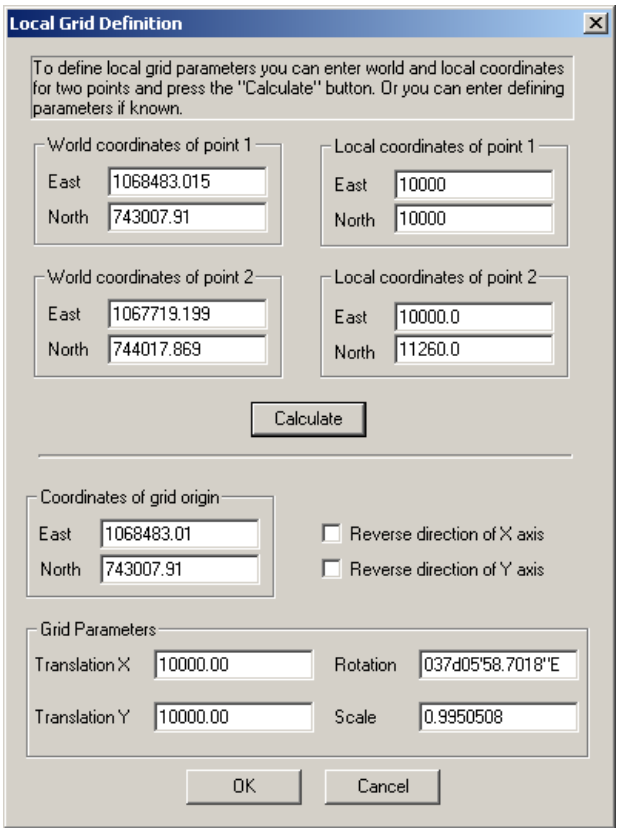
4. **Translate the projection coordinate to a local coordinate.**
   a. **Go back to the GEODETIC PARAMETERS program.** It is still set up for NAD-1983 CT.
   b. **Change the "Grids" frame from "State Plane NAD-83" to "None"**.
   c. **Check the Local Grid Adjustment check box.** Your screen should resemble the one in the following figure.

FIGURE 2-7. *Accessing the Local Grid Dialog through the Geodetic Parameters Window*



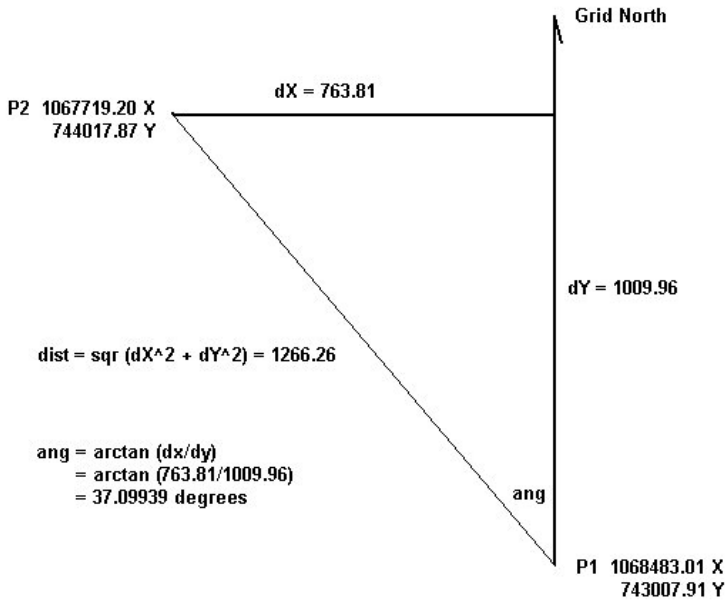
5. **Click [Local Grid].** The Local Grid Definition window will appear.

FIGURE 2-8. *Calculating the X and Y values*



6. **Enter the world and local coordinates of each point and click [Calculate].** The program automatically calculates the local grid parameters and displays them in the dialog.

FIGURE 2-9. Calculating the Distances and Angles in the Local Grid



7. **Click [OK]** again to save your parameters and exit the GEODETIC PARAMETERS program. The local grid parameters are now applied in your project as long as the Local Grid option is checked.
8. **Test your results**.
   a. **Enter the HARDWARE program**. Place your GPS over P1 and run the Test function. The resulting X-Y coordinate should be 10000X and 10000Y.
   b. Now the true test. **Place your GPS antenna over P2 and run the same test.** If you did your math correctly, you should be able to get X=10000, Y=12260.

ENTERING DATUM TRANSFORMATIONS PARAMETERS

To move from the WGS-84 position (lat/long/height) to a position on your local datum, HYPACK® performs a "Datum Transformation". The lat/long/height that describes your position depends upon your mathematical model of the earth (your "Ellipsoid"), and where you place the ellipsoid to fit your terrain (your "Datum"). HYPACK® can perform either a three-parameter datum transformation or a seven-parameter datum transformation in real time. The parameters for this real-time transformation are specified in the GEODETIC PARAMETERS program.

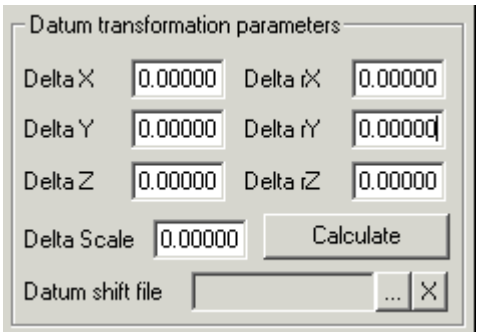
To start the GEODETIC PARAMETERS program, click the GEODETIC PARAMETERS icon. The program loads the current geodetic parameters and displays them. The datum transformation parameters are displayed in the lower right-hand corner of the window.

More Information

- "Calculating Datum Transform Parameters" on page 2-58

SPECIFYING NO DATUM TRANSFORMATION

FIGURE 2-10. *Instructing the GEODETIC PARAMETERS Program not to perform a Datum Transformation*



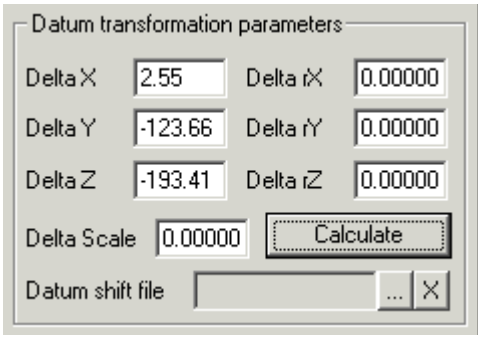
If you do not want HYPACK® to perform a datum transformation, set all of the values in the Datum Transformation window to "0". This flags the program about your intent.

Note: If you are surveying on NAD-83 (GRS-80) or (WGS-84), you do not have to perform a datum transformation and the datum transformation fields are disabled.

SPECIFYING A 3-PARAMETER DATUM TRANSFORMATION

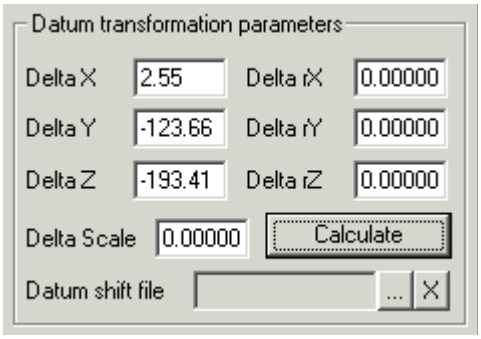
Three-parameter datum transformations work well over a local area. To perform these, you must enter the offsets between the two survey datums. The values, dX, dY, and dZ represent the separation between the geocentric coordinate systems of the two datums. There are many sources for these values. If you know the Latitude/Longitude/Height of a single point in WGS-84 and the local datum, you can run the HYPACK® Datum Transformation program to calculate the necessary values. In the following figure, we have entered dX=2.55 dY=-123.66 and dZ=-193.40. HYPACK® will use these parameters to transform your geographic position in real time.

FIGURE 2-11. *Specifying 3-Parameter Datum Transformation Parameters*



Three-parameter datum transformations work well over a local area. To perform these, you must enter the offsets between the two survey datums. The values, dX, dY, and dZ represent the separation between the geocentric coordinate systems of the two datums. There are many sources for these values. If you know the Latitude/Longitude/Height of a single point in WGS-84 and the local datum, you can run the HYPACK® Datum Transformation program to calculate the necessary values. In the following figure, we have entered dX=2.55 dY=-123.66 and dZ=-193.40. HYPACK® will use these parameters to transform your geographic position in real time.

FIGURE 2-12. *Specifying 3-Parameter Datum Transformation Parameters*



SPECIFYING A 7-PARAMETER DATUM TRANSFORMATION

HYPACK® can also perform a 7-parameter datum transformation. In addition to dX, dY and dZ, the 7-parameter transformation also contains values for rotations about the X, Y and Z-axes, and changes in scale between the two systems. Seven-parameter datum transformations can cover a larger area more accurately than 3-parameter transformations. Certain countries have published 7-parameter transformation values that are to be used for the entire country (e.g. Saudi Arabia). HYPACK® uses the Coordinate Frame Rotation formulas to compute geographic positions on the local datum.

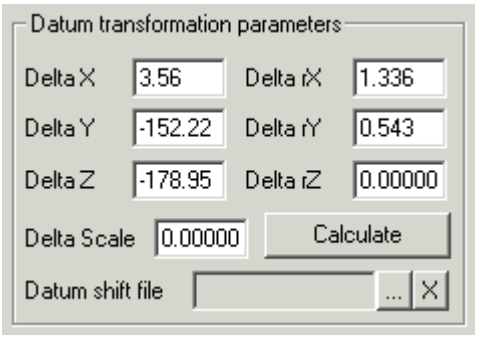
Coordinate Frame Rotation **(EQ 1)**

$$\begin{bmatrix} X' \\ Y' \\ Z' \end{bmatrix} = (1 + dSc) \times \begin{bmatrix} 1 & Rz & -Ry \\ -Rz & 1 & Rx \\ Ry & -Rx & 1 \end{bmatrix} \times \begin{bmatrix} X \\ Y \\ Z \end{bmatrix} + \begin{bmatrix} dX \\ dY \\ dZ \end{bmatrix}$$

Care should be taken when entering the rotation values.

- They are expressed in seconds of arc.
- The Delta Scale is expressed in ppm (parts per million).
- Local conventions may also require you to enter an inverted value (e.g. positives become negatives and negatives become positive.)

FIGURE 2-13. *Specifying a 7-parameter Datum Transformation*



USING CORPSCON TO DETERMINE WGS-84 TO NAD-27 PARAMETERS

For U.S. surveyors operating on the NAD 1927 State Plane Coordinate System, we have built into the program an easy method for determining the local shift parameters.

1. **Set up your geodetic parameters.** The Grids field should be set to NAD-27 and the other fields according to your survey area.
2. **Set your Lat/Long input format** by selecting OPTIONS-DEGREES FORMAT and your preferred format.
3. **Select OPTIONS-DATUM TRANSFORMATION METHOD-CORPSCON**.
4. **Select your DATUM SHIFT FILE**.
   - **For dynamic, real time datum transformations**, select a combined latitude/longitude shift file (*.LLS) by clicking the […] by the Datum Shift field and selecting it from the file selection dialog.

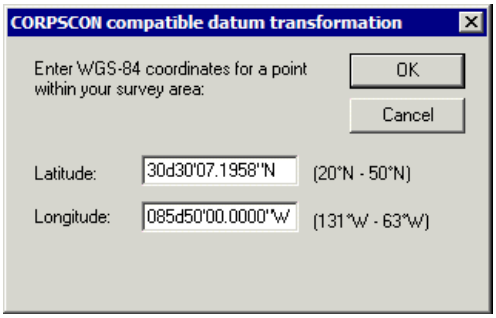
Note: In this case, the Datum Transformation values and the [Calculate] will be disabled. The transformation calculations are done for each position reading during the logging process.

For a set of constant (static) datum transformation parameters using the CORPSCON/NADCON program, select OPTIONS-DATUM SHIFT FILE and select the appropriate *.LLS or *.LAS file.:

TABLE 2-1. *LLS Files Provided by HYPACK®*

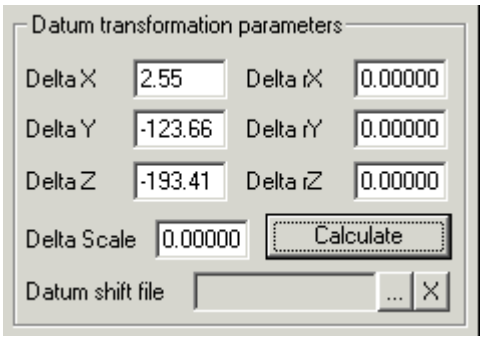
File	Area	Latitude Limits	Longitude Limits
ALASKAE.LLS	Alaska – Eastern Hemisphere	46º to 77º N	166º to 180º E
ALASKAW.LLS	Alaska - Western Hemisphere	46º to 77º N	128º to 180º W
Balr2009.lls	Baleares Islands, Spain	38° TO 40°48'N	0° 50' TO 4°40' E
CONUS.LLS	Continental US	20º to 50º N	63º to 131º W
HAWAII.LLS	Hawaii	18º to 23º N	154º to 163º W
OSTN02.LLS	United Kingdom	49º to 62º N	10º W to 4º E
PRVI.LLS	Puerto Rico & Virgin Islands	17º to 19º N	64º to 68º W
R2009V9.LLS	Peninsular Spain	35°30' to 44°30' N	10°11' W to 4°9' E
STGEORGE.LLS	St. George Island, AK	56º to 57º N	169º to 171º W
STLRNC.LLS	St. Lawrence Island, AK	62º to 64º N	168º to 172º W
STPAUL.LLS	St. Paul Island, AK	57º to 58º N	169º to 172º W

FIGURE 2-14. *Specifying approximate position under [Use Corpscon] option*



1. **Click [Calculate]** and a new dialog will appear.
2. **Enter the coordinates for a point in your survey area and click [OK].** The program searches the CORPSCON database to determine the exact three-parameter shift values for your location. They will be displayed in the GEODETIC PARAMETERS dialog.

FIGURE 2-15. *Results from the [Use Corpscon] option in GEODETIC PARAMETERS*



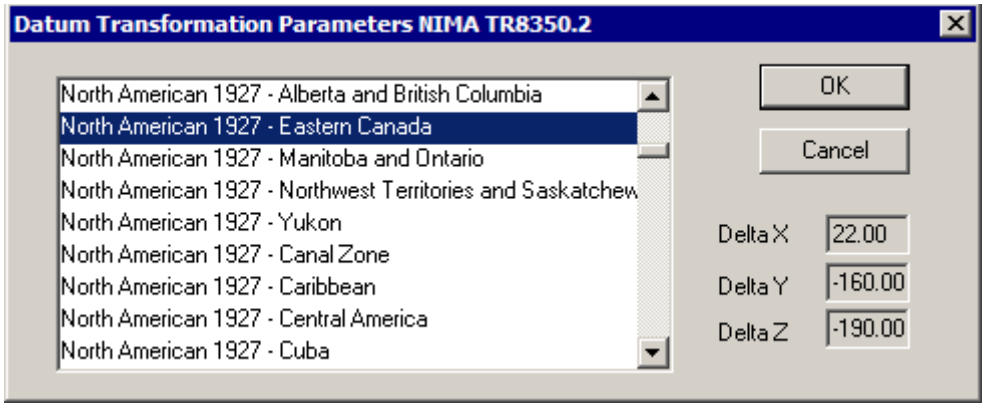
HYPACK® will give you the same result as the U.S. Army Corps of Engineers Coordinate Conversion program (CORPSCON). Tests have shown that HYPACK® gives the same value as CORPSCON, ±3 inches.

USING THE NIMA TABLE TO DETERMINE DATUM TRANSFORMATION PARAMETERS

Surveyors operating outside of the USA can use datum shift values provided by NIMA (National Imagery and Mapping Agency, formerly known as DMA – Defense Mapping Agency) in publication TR8350.2. The accuracy of these values varies and you are advised to consult the NIMA publication for further details.

1. **Set up your geodetic parameters**.
2. **Select OPTIONS-DATUM TRANSFORMATION METHOD-CORPSCON**.
3. **Click [Use NIMA]** and the NIMA TR8350.2 dialog appears. Only the datum transformation values that match your currently selected ellipsoid will be enabled.

FIGURE 2-16. *NIMA Dialog*



4. **Select the area where you are surveying**. The program will calculate a 3-parameter transformation. It will display the dX, dY and

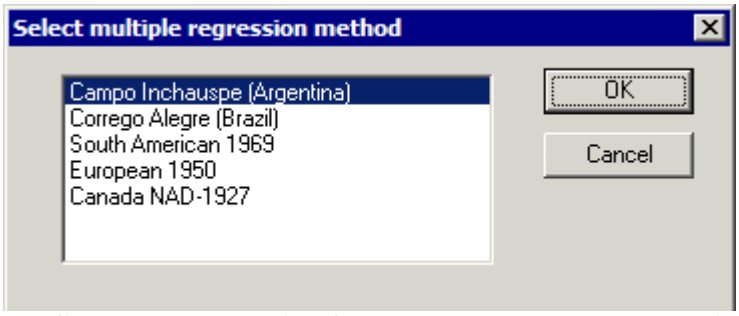
dZ values in this dialog and transfer them to the correct fields in the Geodetic Parameters dialog.

Using Multiple Regression Formulas to Determine Datum Transformation Parameters

Surveyors operating in parts of the world for which NIMA has published multiple regression datum transformation formulas can use those to calculate the datum shift values. The accuracy of these formulas is better than 2 meters.

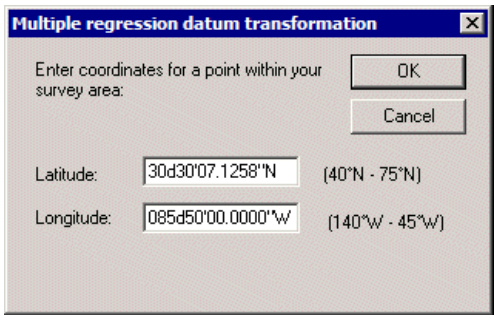
1. **Set up your geodetic parameters**.
2. **Select OPTIONS-DATUM TRANSFORMATION METHOD-MULTIPLE REGRESSION**.
3. **Select OPTIONS-MULTIPLE REGRESSION EQUATIONS**. A listing of multiple regression formulae available in HYPACK® will appear.

FIGURE 2-17. *Choosing the Multiple Regression Equation*



4. **Choose the regression formula you want to use and click [OK]**.
5. **Click [Use Multi. Reg.]** and the Multiple Regression Datum Transformation dialog appears.

FIGURE 2-18. *Multiple Regression Dialog*



6. **Enter coordinates for a point in your survey area.** The program will calculate a 3-parameter transformation. It will display the dX, dY and dZ values in this dialog and transfer them to the correct fields in the Geodetic Parameters dialog.

CALCULATING DATUM TRANSFORM PARAMETERS

The DATUM TRANSFORMATION program calculates three or seven datum transformation parameters from coordinate information listings. These values translate your position data from one datum to another. A 3-parameter calculation requires only one point described in each datum. A 7-parameter calculation requires a minimum of three point pairs.

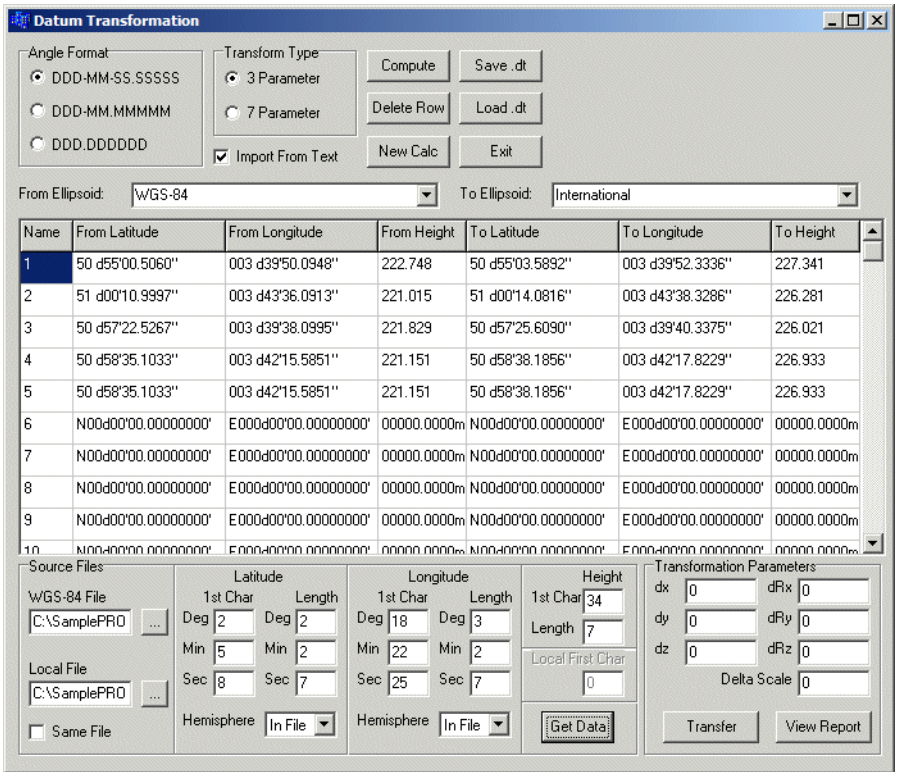
Typically, this program calculates the datum transformation parameters which convert the WGS-84 position to the corresponding position on your local datum. Enter the calculated values in GEODETIC PARAMETERS.

The DATUM TRANSFORMATION program will calculate and display the requested number of transformation parameters and offer to apply them in the GEODETIC PARAMETERS program. It also creates a simple text file summarizing the transformation and listing residual errors for each of the transformed points.

To calculate your transformation parameters:

1. **Set your ellipsoid and projection information** in the GEODETIC PARAMETERS program.
2. **Launch the DATUM TRANSFORMATION program** by selecting UTILITIES-GEODESY-DATUM TRANSFORMATION. The dialog will appear for you to enter your parameters.

FIGURE 2-19. *Datum Transformation Dialog*



Angle Format defines your preferred input format.

Transform Type sets the number of parameters that will be calculated.

NOTE: A 7-parameter transformation requires at least three points.

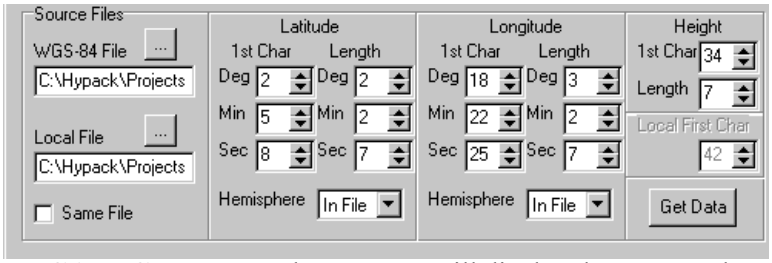
From Ellipsoid: The ellipsoid of your source data. If you are calculating transform values for your geodesy settings, this will typically be WGS-84, the most common GPS output.

To Ellipsoid: The ellipsoid to which you want to convert. Typically, this is your survey ellipsoid.

Lat/Lon/Height: In the spreadsheet area, you must describe each point or points with two sets of coordinates--one in WGS84 and the other based on your local datum.

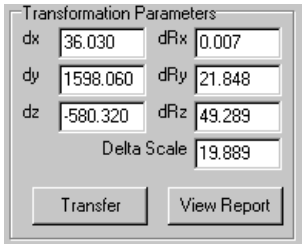
The **Import from Text** check box allows you to import coordinates from text files. This handy option can save a lot of time typing if you happen to have the coordinates in another file. If this option is selected, the bottom section provides a display to describe the positioning of your data in the file (or files). Refer to the following sections on creating and importing the text files.

FIGURE 2-20. *Import Parameters*



3. **Click [Compute].** The program will display the requested number of transformation parameters and creates a simple text file summarizing the transformation and listing residual errors for each of the transformed points.

FIGURE 2-21. *Seven Parameter Transform Calculation*



4. **Click [Transfer]** (optional) to copy the calculated parameters to your geodetic parameters.

To do multiple calculations with different data points:

Click **[New Calc].** The spreadsheet will be cleared for you to enter another set of points.

CREATING TEXT FILES FOR THE DATUM TRANSFORM PROGRAM

The DATUM TRANSFORMATION program can import the sample coordinates to the spreadsheet from ASCII text files. You can enter:

- One text file containing both sets of coordinates, or
- Two files, each containing one set of coordinates—One in WGS-84 and one based on your local grid.

These files are easily created using any text editor.

To use one text file, each point should be entered in lat/long/height and using the same format, with WGS84 first followed by the local datum information. Both coordinate pairs must reside on one line.

To use two files, each should contain the point information, entered in the same order and format to permit the program to compare them accurately.

NOTE Additional text may be included in each line, as long as all lines are formatted in the same way to allow comparison.

FIGURE 2-22. *Local Ellipsoid Coordinate Data*

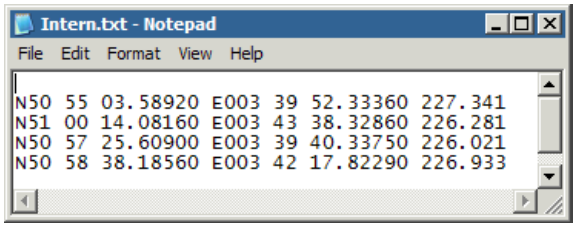


FIGURE 2-23. *WGS-84 Coordinate Data*

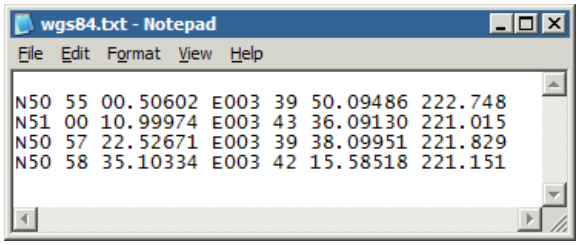
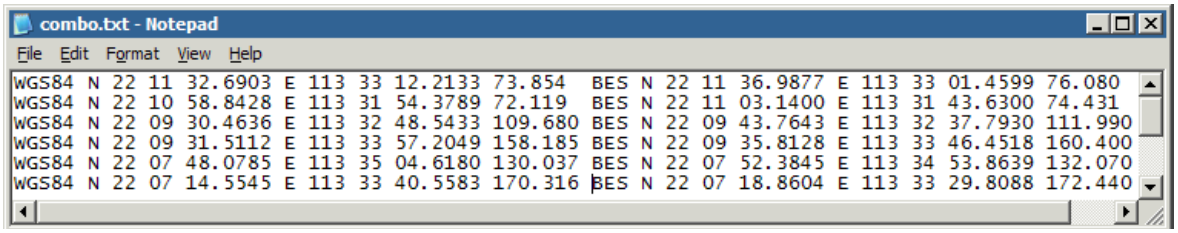


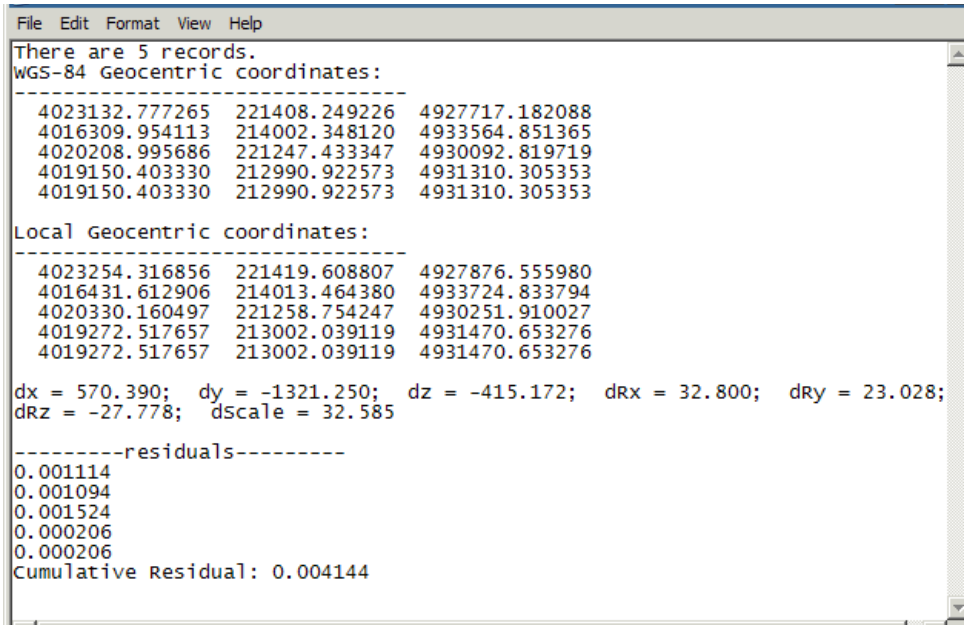
FIGURE 2-24. *Both Sets of Coordinate Data in One Document*



DATUM TRANSFORMATION REPORT

To see a summary of the transformation and a listing of residual errors for each of the transformed points, click [View Detailed Report]. This report may be saved or printed using the Windows® Notepad functions.

FIGURE 2-25. *Sample Report*



GEODESY UTILITY PROGRAMS

The UTILITIES-GEODESY menu section contains the following programs.

Datum Transformation	Compute the 3-parameter transformation shift parameters and test 3- and 7-parameters transformation parameters.
Grid Conversion	Convert from WGS-84 Latitude-Longitude to Local X-Y and the same in reverse.

Traverse	Computes an open traverse calculation on the ellipsoid.
Units Conversion	Converts between different types of angle and distance units.
Project Converter	Converts the project files, and edited and sorted data files in a project with one set of geodetic parameters to a new project with different geodetic parameters.

In all of the GEODESY programs:

- Enter degrees, minutes and seconds with comma separators.
- West Longitude and South Latitude as negative numbers (with the exception of GRID CONVERSION).

GRID CONVERSION PROGRAM

The GRID CONVERSION program allows you to convert:

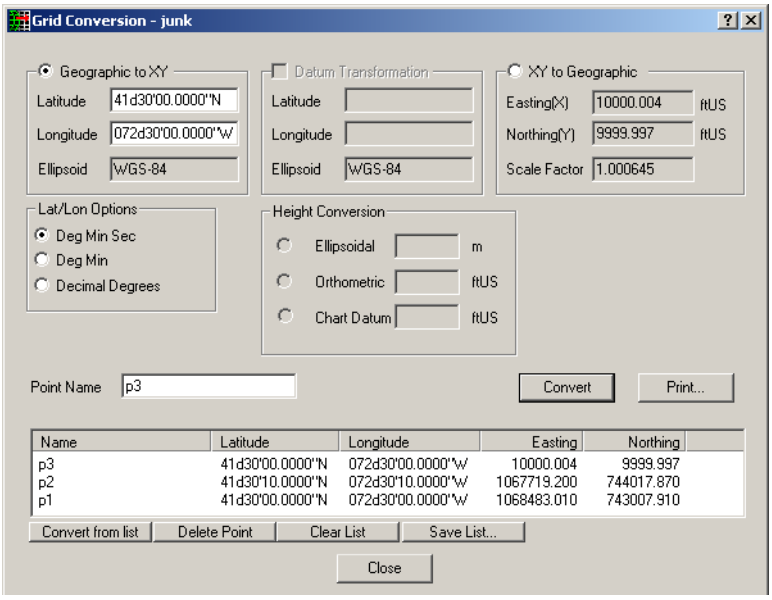
WGS-84 Lat/Long	=>	Local Lat/Long	=>	X-Y
X-Y	=>	Local Lat/Long	=>	WGS-84 Lat/Long

This is the same conversion used by SURVEY as it received position data from your GPS (in WGS-84) and converts it for your local datum.

To Perform a Grid Conversion:

1. **Configure the geodetic parameters** as the GRID CONVERSION program uses the current setting as the basis for its conversion. You can access the GEODETIC PARAMETERS program from the GEODETIC PARAMETERS icon on the toolbar.
2. **Enter the GRID CONVERSION** program by clicking UTILITIES-GEODESY-GRID CONVERSION. The Geodetic Conversion dialog will appear.

FIGURE 2-26. *The Geodetic Conversions Window*



3. **Indicate whether you want to transform from Geographic Position (Lat/Long) to X-Y or from X-Y to Geographic Position (Lat/Long)**.
4. **Name your point.** This is optional.
5. **Enter either the X-Y coordinates or the Latitude and Longitude.** After you enter the Y or the Longitude and hit the Enter key or click [Convert], the information will be computed and displayed.

[Print] sends a report to the printer listing:

- the input data,
- the current project geodesy settings
- the calculated output data

[Convert from list] enables you to select one of your points in the converted list and re-enter the information in the upper part of the dialog without retyping the information.

To remove points from the list of converted points:

- **[Delete point]** erases the selected point.
- **[Clear list]** erases all points in the list.

[Save list…] saves your converted points, by default, to a Target file (*.TGT) in your project directory.

TRAVERSE PROGRAM

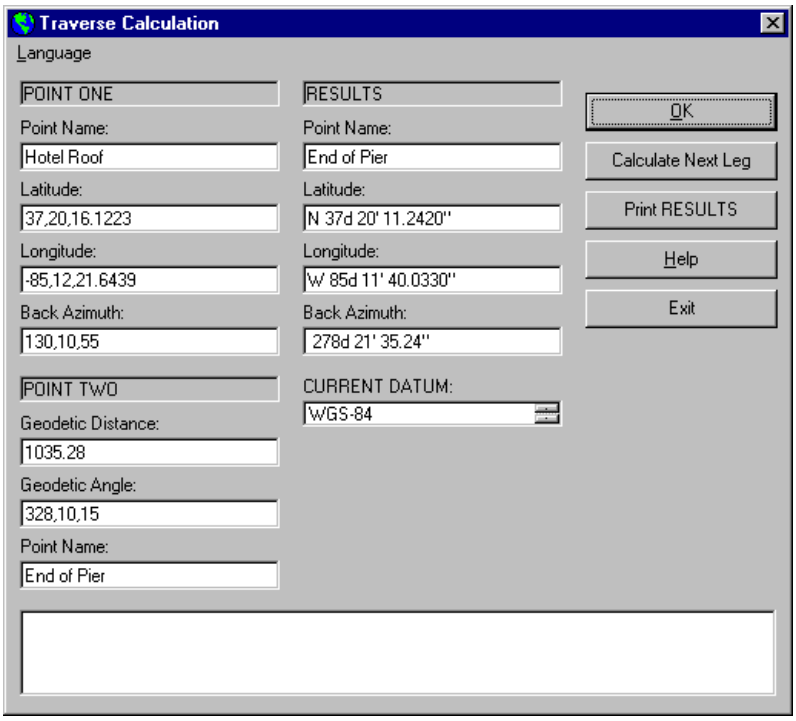
Computes an open traverse calculation on the ellipsoid

A traverse computes the forward position of a point, using a previous point, a backsight point and the measured angle and distance to the next point. Since this point computes the position on the ellipsoid, the distance

and azimuth information into the program must be geodetic, instead of grid-based.

1. **Enter the TRAVERSE program** by clicking UTILITIES-GEODESY-TRAVERSE.

FIGURE 2-27. *The Traverse Window*



2. **Enter Latitude and Longitude** for your starting point.
3. **Enter the Back Azimuth from the starting point to your backsight**.
4. **Enter the Geodetic Distance and Geodetic Angle for the next point** in the traverse. Click [OK].

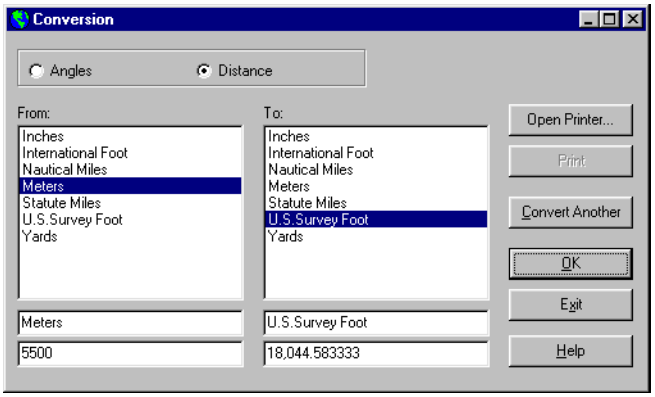
The program calculates the position of the new point. You can print this step in the traverse by clicking on **[Print Results].**

[Calculate Next Leg] erases the Point Two data so you can input a new set for a new calculation.

UNITS CONVERSION PROGRAM

The UNIT CONVERSION program is used to convert between different angular and distance measurements.

FIGURE 2-28. The Unit Conversion Window–Converting Distance



1. **Select either Angles or Distance** by clicking on the coinciding button at the top left.
2. **Select the Units** you are converting From and To by clicking on the respective menus.
3. **Enter the units you are converting from** in the format specified at the base of the From column.
4. **Click [OK]**.

The converted angle or distance will appear at the bottom of the To column.

If you wish to calculate another conversion, click on **[Convert Another].** The screen will reset and you may repeat the same process.

To print your calculations to the default Windows® printer, click [Open Printer] to use the Windows® printer setup dialog, then click [Print Results].

PROJECT CONVERTER

The PROJECT CONVERTER can convert the ASCII project files, and edited and sorted data files in a project with one set of geodetic parameters to a new project with different geodetic parameters.

It was originally created to assist users who are phasing out NAD-27 surveys in favor of NAD-83 surveys. For these surveyors, translating survey lines will improve the accuracy of historic comparisons between the old NAD-27 and the new NAD-83 surveys.

The PROJECT CONVERTER will also solve problems for surveyors who unknowingly collected data using incorrect geodesy settings. Those in this category no longer have to resurvey the area to correct the error.

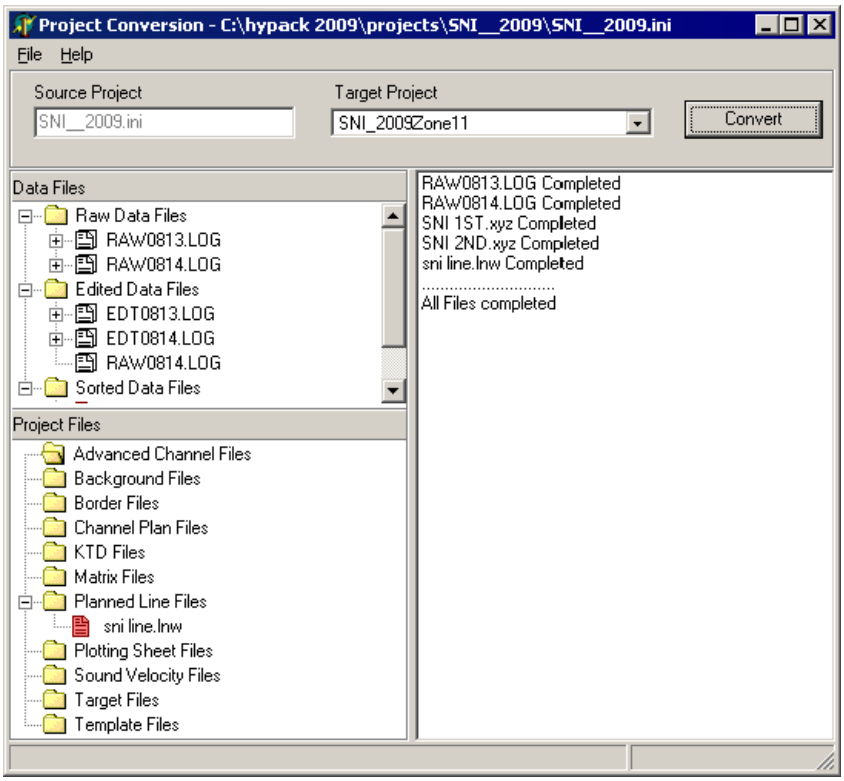
NOTE: Binary data and most chart files can not be converted.

1. **Create a new project** with the new geodetic parameter settings.

NOTE This project must be in the same directory as the original source project.

2. **Launch the PROJECT CONVERTER** by selecting UTILITIES-GEODESY-PROJECT CONVERTER.

FIGURE 2-29. *Project Converter*



3. **Tell the program whether your projects are in the local Projects directory or on a network drive**.
4. **Select the Source Project** by selecting the project with files that you want to convert in the drop-down menu. The geodesy settings will be listed.
5. **Select the Target Project** by selecting your new project.
6. **Select the files you want to convert**. (Most file types are convertible.)
   - **[Add a File]** enables you to load one file at a time from a File Selection dialog.
   - **[Add All Files]** automatically searches the source project folder for all convertible files of the types selected under 'Include'.
   - **To remove files from your list**
     - Start over by using **[Clear List].**
     - Select an individual file and click **[Remove Item].**
7. **Convert the files by clicking [Convert].** The status of the conversion is listed at the right.

TEXT TO XYZ

The TEXT TO XYZ utility extracts position and depth data from a text file and stores it to an XYZ file, which can then be read by HYPACK® modules.

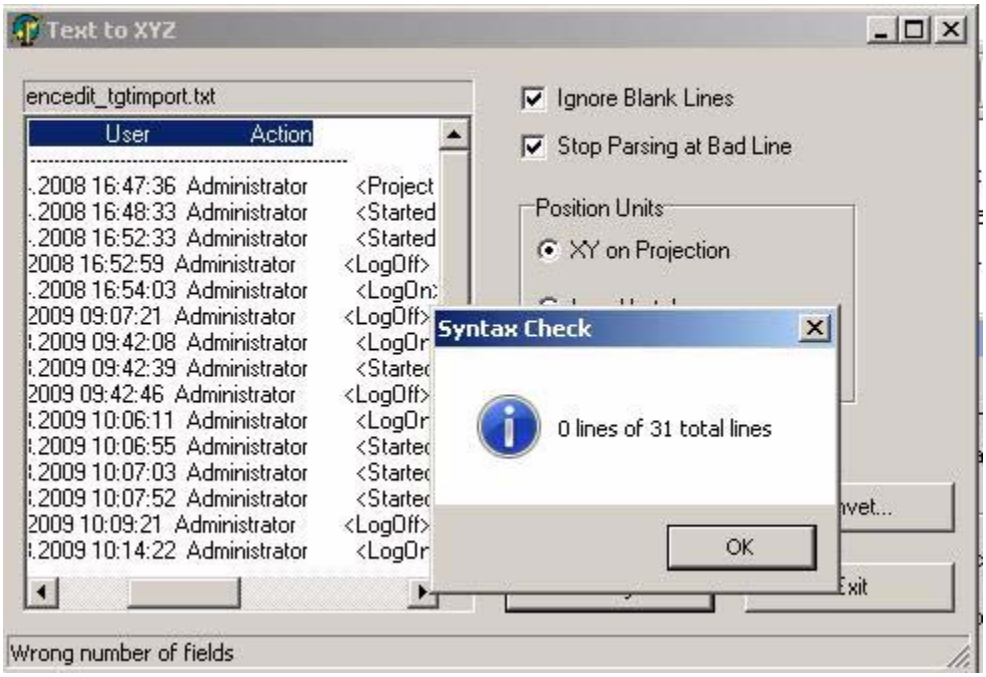
Horizontal positions may be in either lat./lon. or XY. Latitude and Longitude values are converted to XY using the geodesy in the current HYPACK® project.

RUNNING A TEXT TO XYZ CONVERSION

1. **Launch the Text to XYZ utility** by selecting UTILITIES-GEODESY-TEXT TO XYZ.
2. **Enter your options on the right.**
   - **Position Units** : The program reads the standard lat/long formats and, of course, X,Y, Z.
   - **"Stop Parsing at Bad Line":** This means on the first line the program can't decode, it will highlight the offender and show a description of what caused the parse to fail in the status bar. Here we see the first line highlighted and the error "Wrong number of fields". If this option is unchecked, the program will move to the next line and parse again. At the end the program will report how many of the input lines are convertible out of the total found.
   - **Ignore Blank Lines:** A blank line (no fields) will always fail. To suppress any messages from such cases, you can check the this option.
3. **Load your text file.** [Load Data] provides a File Select dialog for you to choose your input text file.

   After loading the data into the program, it will be displayed line-by-line, on the left side of the dialog. The parser works with one whole line per parsing pass. The visual display of the data is great for quickly spotting problems; if this is the case, correct the text format and begin the conversion process again.

FIGURE 2-1. Results of importing text of unacceptable format



4. **Click [Convert] and enter an output filename.**

TEXT TO XYZ INPUT FORMATS

The program reads each line one "field" at a time. It recognizes fields by what separates them, in this case, spaces or commas.

The number of fields and the required format in the input text file is determined by the **Positional Units** settings.

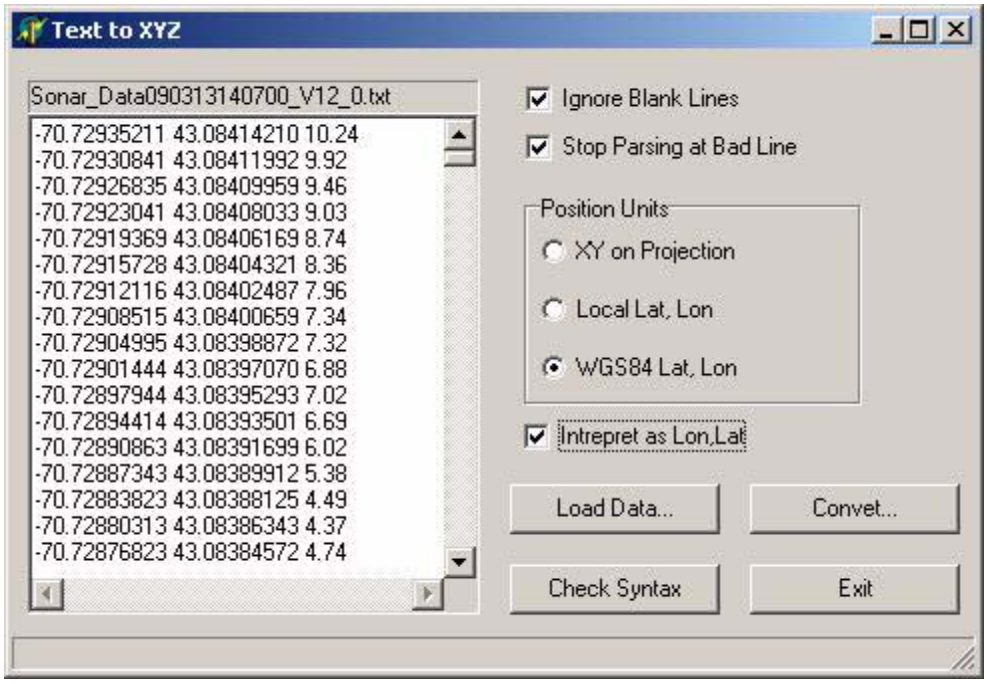
- **XY on Projection** requires a minimum of 3 fields. The first will be treated as X, the second as Y and the third as Z. This can be useful for extracting the XYZ elements from an XYZ-date-time file.
- **Latitude/Longitude options:** The number of fields is determined as follows:
  - The last field is Z.
  - The rest of the fields are equally divided between Lat and Lon.

    This allows the parser to handle the standard Latitude Longitude input styles used in much of the HYPACK® package. As a review, HYPACK® will generally allow Latitude or Longitude input as follows:

70 or 70.2	decimal degrees
70 20 or 70 20.3	degrees decimal minutes
70 20 15 or 70 20 15.3	degrees minutes decimal seconds
N70 20 or N 70 20.2 or 70 20.2 N etc.	N/S or E/W modifier at start or end, with or without space
+70 20 or -70 20.3	N/S or E/W modifier in magnitude form

NOTE: Both the Latitude and Longitude fields should be encoded in the same format.

FIGURE 2-2. *Text to XYZ User Interface with Correctly Formatted Input.*



PLANNED SURVEY LINES

Planned survey lines (*.LNW) are used to define where you want your vessel to go. The line file contains the grid coordinates and names for each planned line in your survey area and can also contain cross section template information. Line Files are typically created in either the LINE EDITOR or the CHANNEL DESIGN program.

Planned lines are generated in the following programs:

- LINE EDITOR
- CHANNEL DESIGN
- DXF TO LNW
- DGN TO LNW
- LNW GENERATOR

Planned lines are saved with an LNW extension and are usually saved in the project directory. You should give each set of planned lines a unique name which will allow you to determine for what area the survey lines were created.

A 3-dimensionalplanned line file can be used by SURVEY to provide channel information in the profile window. SURVEY will also store the template information in the headers of the data files where it can be read by the editor and other post-processing programs..

Although it is possible to collect survey data without planned lines, it will make the editing process more logical if you have referenced some kind of survey lines in your area.

SPACING PLANNED LINES

Line spacing for single transducer surveys is somewhat arbitrary, because full bottom-coverage is almost never practical. For sweep surveys, where full bottom-coverage is practical, line spacing is usually chosen to insure full coverage.

If your boat is equipped with a multibeam system, where the coverage of a single sweep varies depending on water depth, line spacing will often change from one survey to the next. Some simple trigonometry gives the coverage relationship with water depth.

- **Port Coverage** = Water Depth x Tan(Port Theta)
- **Starboard Coverage** = Water Depth x Tan(Starboard Theta)
- **Sweep Coverage** = Port Coverage + Starboard Coverage

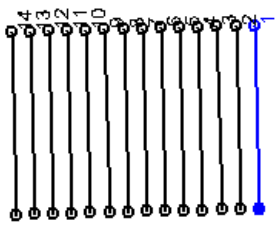
It is tempting to orient the sweep transducer with somewhat side-looking geometry, as this increases the coverage per sweep. Be careful about this because the trade-off is decreased data quality in the outer beams.

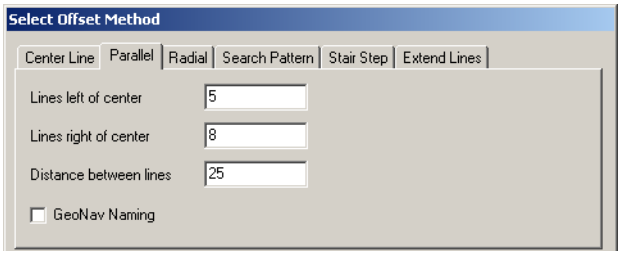
OFFSET PATTERNS FOR PLANNED LINES

Planned lines can be created in any one of several patterns using the Offsets function. All of the following patterns are available when you generate lines in the LINE EDITOR. CHANNEL DESIGN generates only the center line pattern.

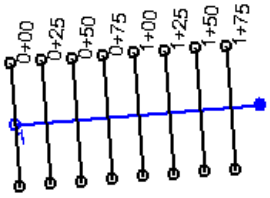
TABLE 2-1. *Planned Survey Line Offset Patterns*

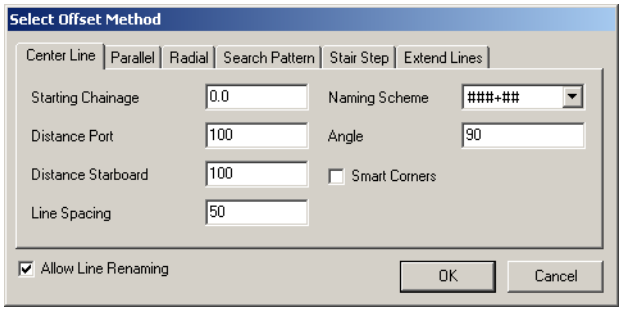
Parallel Offsets create parallel lines on either side of the initial line.



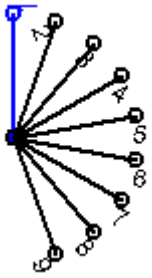


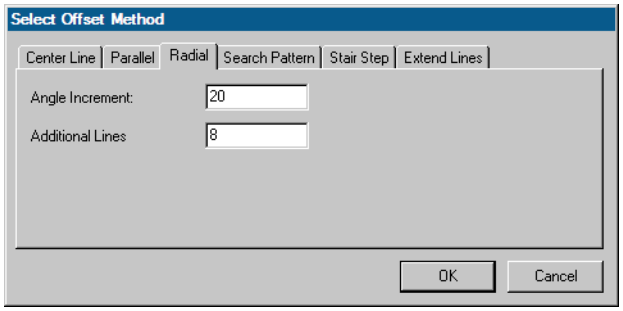
Center Line Offsets create perpendicular lines at user-defined spacing along the initial line.



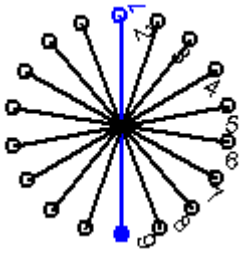


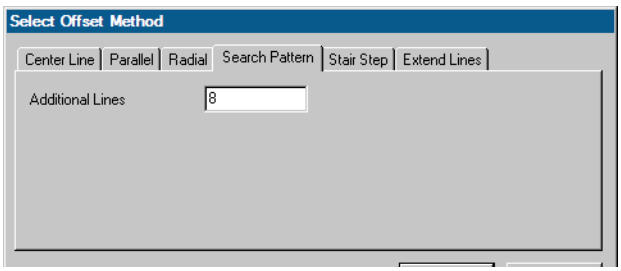
Radial Offsets pivot your planned line about the first point entered.



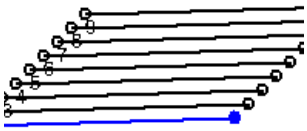


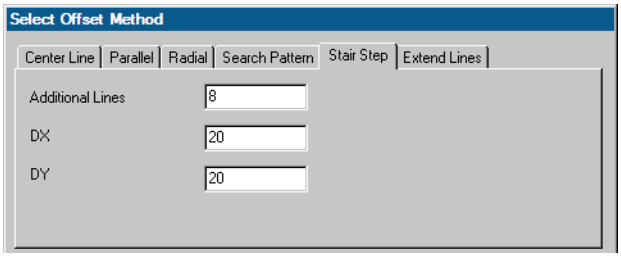
Search Offsets pivot your planned line about the midpoint of the first segment.





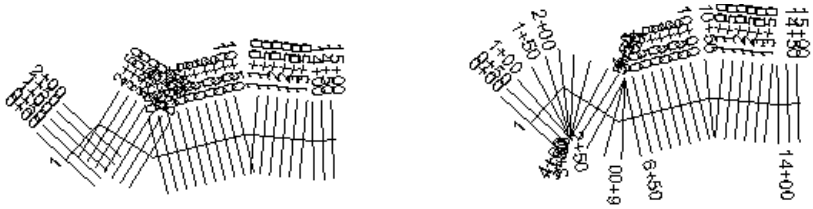
Stair Step Offsets add user-entered X, Y values to each waypoint creating a stair step effect.





The Centerline pattern includes the Smart Corners option which rotates lines about the intersection of the planned line and the channel center line so that the line does not intersect with any other planned line.

FIGURE 2-1. *Centerline Pattern - No Smart Corners (left), Smart Corners (right)*



The Offsets dialog also includes an Extend Lines tab where you can adjust the length of existing survey lines. This enables you to expand your survey area and maintain the ability to do accurate historical comparisons with previous surveys.

CREATING PLANNED LINES IN THE LINE EDITOR

LINE EDITOR creates planned line files. Create each line individually, or create one line then additional lines offset in a choice of several patterns. There is no limit to the number of waypoints per line or lines per file.

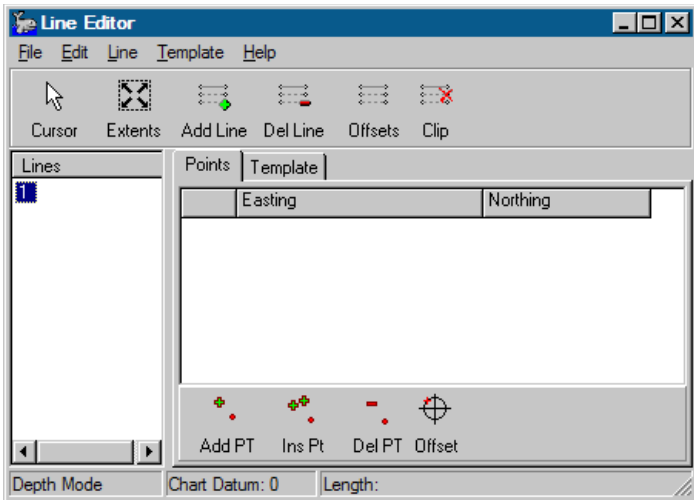
The LINE EDITOR is most commonly used to make two-dimensional line files, but you can choose to add channel template information to generate three-dimensional lines.

You may either manually enter the information for each line in the survey area, or create offsets from an initial line using the Offsets feature.

To create planned lines in the LINE EDITOR:

1. **Open the LINE EDITOR.** Select PREPARATION-EDITORS-LINE EDITOR.

FIGURE 2-2. *Line Editor Dialog*



2. **Choose to enter your position information in XY or Lat/Lon format.** Select EDIT-INPUT MODE and your choice. Lat./Lon. coordinates from the local datum will be entered according to the default format specified in the HYPACK® Control Panel.

   NOTE: The LNW file will always store the coordinates in XY format.

3. **Set your line naming options**. (Optional)
4. **Define your planned lines** by entering the waypoints that describe each line. Each page on the spreadsheet represents a separate planned survey line and may be viewed by selecting the line name in the left-hand pane.
5. **Create and apply channel template information**.. (Optional)
6. **Save your planned line file** by selecting FILE-SAVE or FILE-SAVE AS and naming your file. Your data will be saved with an .LNW extension to your project directory and enabled in the project files listing.

LINE NAMING OPTIONS

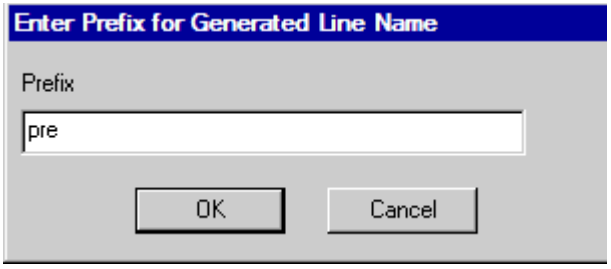
If you prefer something more than a simple line number to identify each planned line in the file. You can pre-define a text string that will be appended to the line number as specified. This feature is optional and must be set each time you enter the LINE EDITOR.

NOTE This option is not available for lines created using centerline offsets.

To define a prefix or suffix:

1. **Select LINE-LINE NAME PREFIX or LINE NAME SUFFIX**. A dialog will appear.

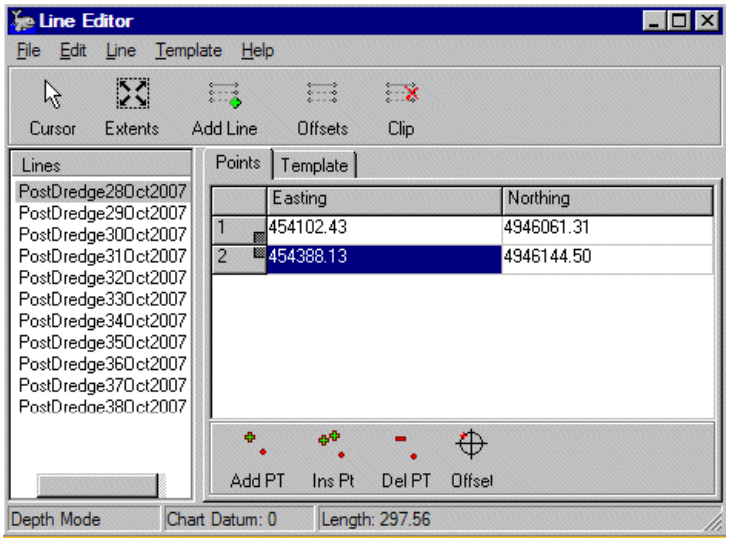
FIGURE 2-3. *Line Name Prefix and Postfix Dialog*



2. **Enter the required text string** and click OK.

Once a string has been entered, it will appear next to the menu selection and will be appended to all lines created after that until you change the string definition or close the LINE EDITOR.

FIGURE 2-4. *Line Names with Prefix and Postfix*

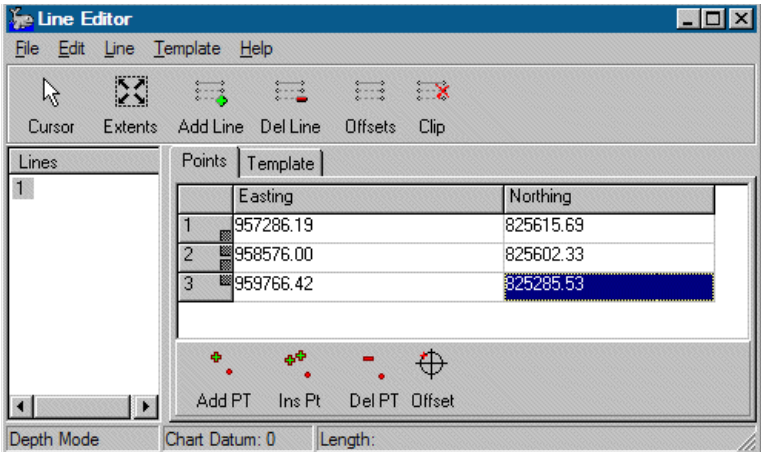


CREATING 2-DIMENSIONAL PLANNED LINES - SPREADSHEET METHOD

1. **Create the spreadsheet** by clicking the Add Point icon once for each waypoint you wish to enter in the initial survey line. Each point will be automatically filled with the coordiantes of the upper left corner of the area map.

2. **Edit the coordinates with the waypoint position information for the first line** into the spreadsheet.

FIGURE 2-5. *Entering the Initial Line in Line Editor*



3. **Create your offsets.** You can do this :
   - **Automatically**:
     i. **Click on the Offsets icon**. The offsets dialog will appear.

     ii. **Select the pattern of lines** you wish to use by selecting the corresponding tab.

     iii. **Enter the number of offsets to be created as well as the distance or angle between them**. For Parallel and Center line Offsets, imagine you are standing at the start of the initial line looking toward the end to determine which way is left or right (port or starboard). The center line pattern also requires a **chainage** on which the line numbering will be based and the **angle** at which the offsets will be generated relative to the center line .

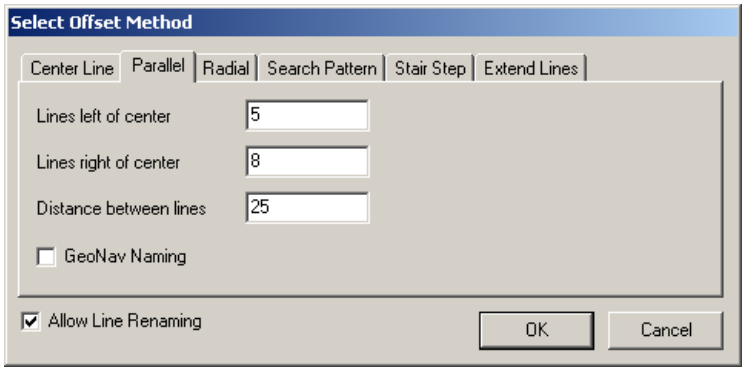
     iv. **If you are generating parallel offsets, choose whether to allow line renumbering.**

     When the LINE EDITOR generates your offset lines, usually, it creates (and numbers) the offsets, in sequence, after the initial line (eg. 1,2,3,4,5). However, since you can generate parallel offsets on either side of the initial line (line '1'), they would be out of sequence (eg. 2,3,1,4,5).

     To generate lines sequentially numbered, we have to renumber (rename) the lines by checking 'Allow Line Renumbering'.

     TIThere are times, such as when you have generated offsets more than once, when this method of renumbering will not yield a sequential line set. If this is the case, select LINE-RENUMBER. The LINE EDITOR will renumber all of the lines in the file.

FIGURE 2-6. Offsets—Parallel Tab

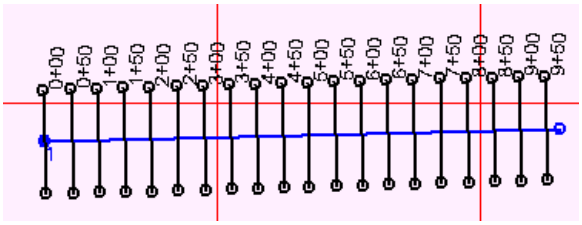


v. **Click [OK].** HYPACK® will display your filled spreadsheet and the lines will be drawn to the screen.

- **Manually** by adding lines and entering all of the waypoint data into the spreadsheet. (If you have a file with a lot of waypoints, you'll need a lot of time and patience for this option .)

4. **Preview your lines by clicking the Extents icon.** The LINE EDITOR spreadsheet will minimize and the area map will zoom in to the line file.

FIGURE 2-7. Previewing Your Lines



5. **Return to the LINE EDITOR** by clicking [Line Editor] at the lower left.
6. **Name individual lines** (optional) :
   - Select LINE-LINE NAME and provide the name in the dialog that appears.

   OR

   - Right-click on the current line name, select 'Rename' and enter the new line name.
7. **You may edit your lines**, in the spreadsheet or with the cursor, if you wish. Continue to preview and edit until your lines are satisfactory.
8. **Save your file** by selecting FILE-SAVE and naming your file. Your data will be saved with an .LNW extension to your project directory and enabled (drawn to the screen) in your project.

NOTE You may start again by selecting FILE-CLOSE. Confirm that you do not wish to save the file and the LINE EDITOR will return to the point when you first launched it.

More Information

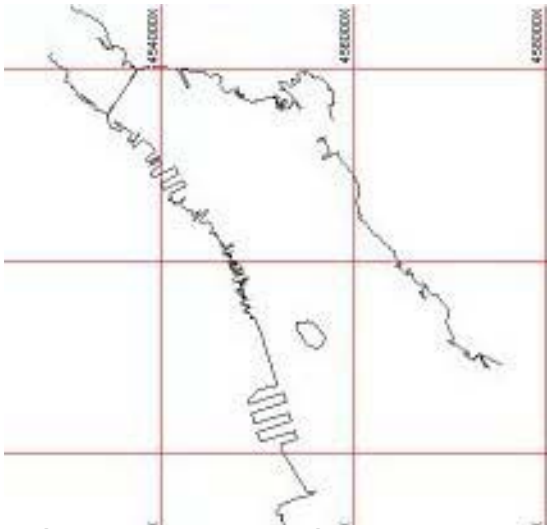
- "Offset Patterns for Planned Lines" on page 2-72
- "Editing your Planned Line File in the Line Editor" on page 2-85

CREATING 2-DIMENSIONAL PLANNED LINES USING THE CURSOR AND OFFSET TECHNIQUE

You can interactively create planned survey lines in the LINE EDITOR. Once you are in the LINE EDITOR follow the following steps:

1. **Open a Background File** (optional) of your survey area.

FIGURE 2-8. *Sample Background File*



2. **Open the LINE EDITOR**.
3. **Create your initial planned line.** Click the Cursor icon and the LINE EDITOR will minimize.

4. **Left click on the area map to mark each waypoint in the initial line**.
5. **Restore the LINE EDITOR** by clicking [Line Editor] at the bottom left. You can review the points of your first line, and then continue.
6. **Create your Offset Lines**. You may do this:
   - **Automatically** using the Offsets icon and HYPACK® will automatically make them for you.
     i. **Click the Offsets icon.** The offsets dialog will appear.

     ii. **Select the pattern of lines** you wish to use by selecting the corresponding tab.
     iii. **Enter the number of offsets to be created as well as the distance or angle between them**. For Parallel and Center line Offsets, imagine you are standing at the start of the initial

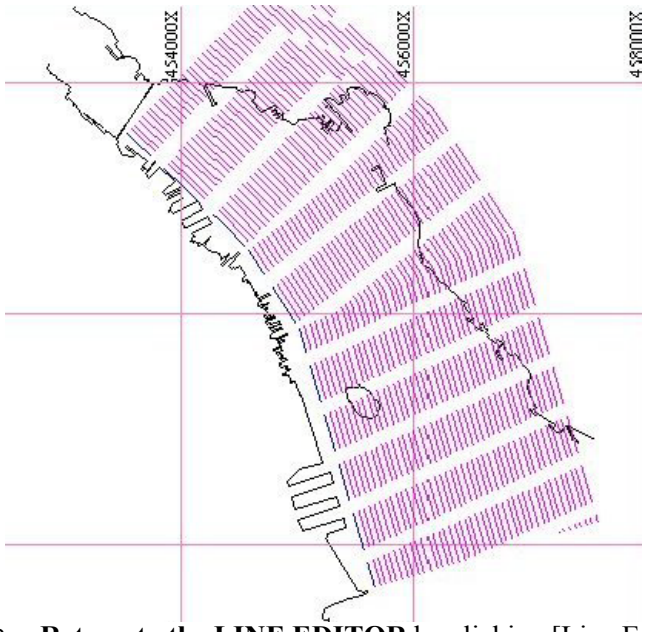
line looking toward the end to determine which way is left or right (port or starboard).

iv. Choose whether to allow line renaming. **Click [OK].** HYPACK® will create the additional offset lines and display your filled spreadsheet.

- **Manually** adding each line as described in "Editing your Planned Line File in the Line Editor". Repeat this process until all of your offsets have been defined.

7. **Preview your lines** by clicking the Extents icon. The LINE EDITOR spreadsheet will minimize and the area map will zoom in to the line file.

FIGURE 2-9. *Planned Lines Preview on HAL.DIG*



8. **Return to the LINE EDITOR** by clicking [Line Editor] at the lower left.
9. **Name individual lines** (optional) :
   - Select LINE-LINE NAME and provide the name in the dialog that appears.

   OR

   - Right-click on the current line name, select 'Rename' and enter the new line name.
10. **You may edit your lines in the spreadsheet** or with the cursor if you wish.
11. **Continue to preview and edit until your lines are satisfactory**.
12. **Save your Line File:** Select FILE-SAVE and name your file and file location. Your data will be saved by default to your project directory with an .LNW extension.

NOTE You may start again by selecting FILE-CLOSE. Say that you do *not* wish to save the file and the LINE EDITOR will return to the point when you first launched it.

More Information

- "Loading Background Charts to the Project" on page 2-4
- "Editing your Planned Line File in the Line Editor" on page 2-85

CREATING PLANNED LINES TO FIT YOUR SURVEY AREA

You can create a Border File in the Border Editor, which defines the boundary areas of your survey area. Use it to guide HYPACK® in creating or "clipping" the Survey Lines to exactly fit within a coastline or unorthometric survey area.

Create one or more border files to describe your survey area. You will need one border to define the perimeter of your survey area. Additional border files may be required if there are obstructions, such as islands, in your survey area that will disrupt your line pattern.

NOTE The last point of the border describing the perimeter should always be *inside* the border area. The last point of borders describing unsurveyable areas, such as islands, within the survey area should be outside the border area.

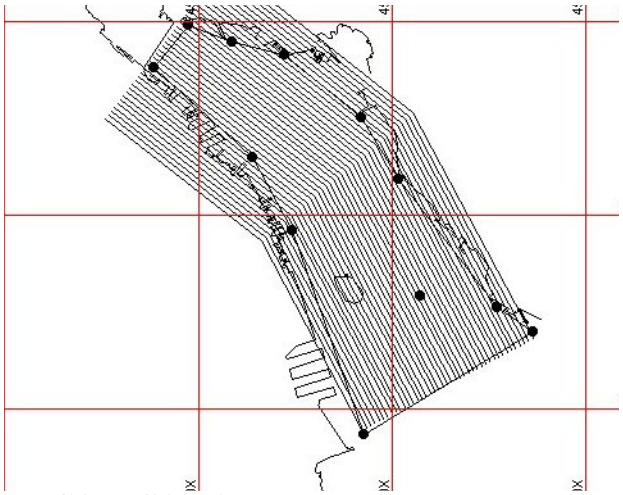
Once you have defined your survey area with border files, you can clip existing line files or generate a new line set within the border defining the perimeter.

CLIPPING PLANNED LINES TO THE SURVEY AREA

If you have a planned line file whose lines extend outside the suryey area, you can use a Border file to clip the lines to fit your area.

1. **Create a Border File** (or Border Files) defining the boundaries of your survey area.
2. **Open your planned line file** by opening the LINE EDITOR and clicking FILE-OPEN then selecting the correct line file.

FIGURE 2-10. *Planned Line File with Border File overlaid*

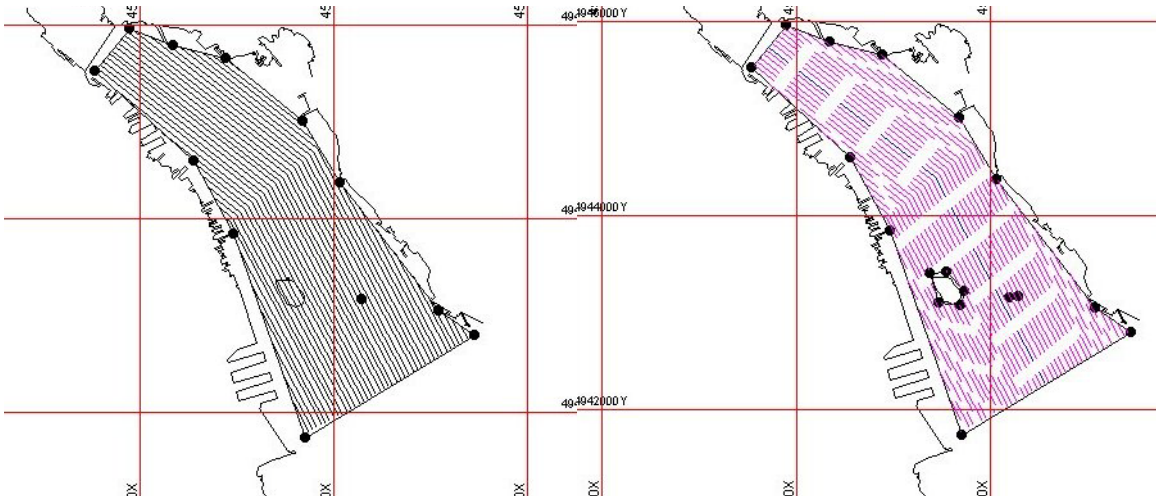


3. **Click [Clip Lines].**

4. **Select the Border File** that you want to clip with and click [OK]. HYPACK® does the rest. If the border is concave and lines are broken, the segments toward the end of the line will be renamed with an "_*Number*" appended. For example, line 2 would become "2" and "2_1".

NOTE You may need to repeat this process multiple times if you have more than one Border File.

FIGURE 2-11. *Clipped Planned Lines --After First Clip (left) and Second Clip (right)*



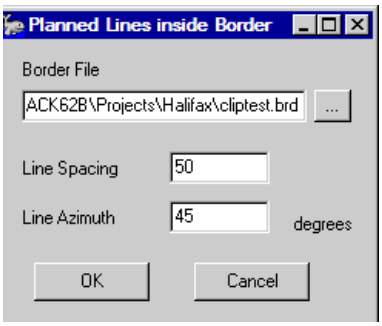
5. **Save your file**. Use FILE-SAVE if you want to overwrite your original line file. Use FILE-SAVE AS to preserve your original line file and save the clipped lines to a different name. The line file will be saved to your project directory and enabled (drawn to the screen) in your project.

Creating Planned Lines inside a Border File

If you are creating a new line file the LINE EDITOR can create a set of survey lines with user-defined spacing and azimuth to fit within the border file.

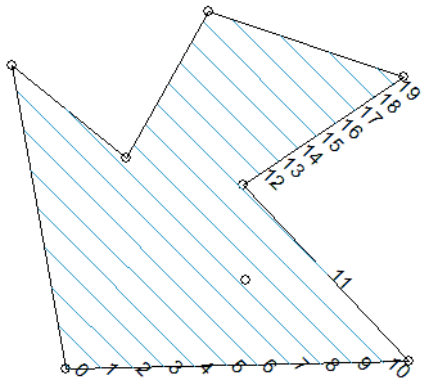
1. **Create the Border file** to describe the perimeter of your area. Take care to place the last point inside the area defined.
2. **Open the LINE EDITOR**.
3. **Select LINE-GENERATE LINES IN BORDER**. A dialog will appear.

FIGURE 2-12. *Entering the parameters to create lines inside a Border file.*



4. **Enter Border file, line spacing and line azimuth for your file and click [OK].** The lines will be generated and drawn to the design window for preview.
5. **Save your Line file** by selecting FILE-SAVE and naming your file.

FIGURE 2-13. *Sample Line File within a Border*



Generating Planned Lines at Multiple Predefined Locations

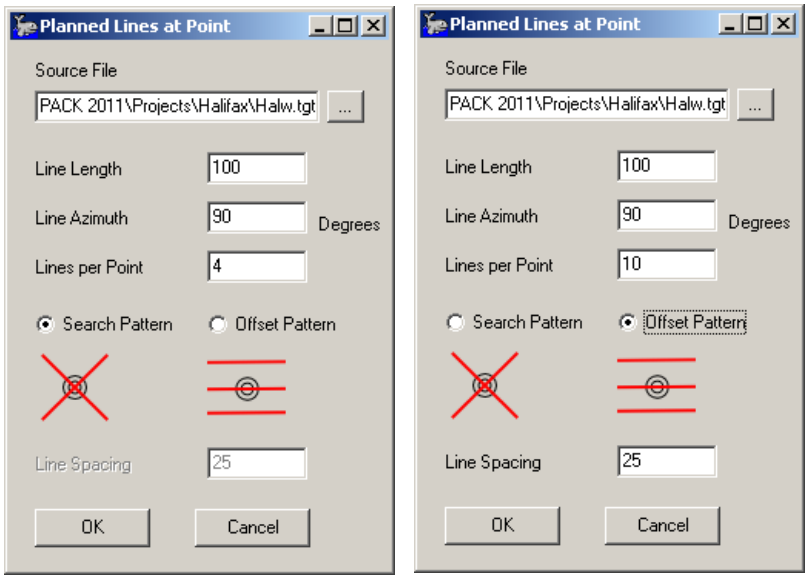
The LINE EDITOR includes a routine that generates a set of planned lines centered over each position from a target file or XYZ file. It's a useful tool to quickly generate a search pattern or parallel offset lines over several predefined locations.

1. **Create the file to be used for positioning.** You may easily create a target file in the TARGET EDITOR or the XYZ file in the XYZ COLLECTOR.
2. **Open the LINE EDITOR and select FILE-NEW**.
3. **Select LINE-PLANNED LINES AT POINT.** The Planned Line at Point dialog will appear.
4. **Enter the parameters on which the lines will be generated**.
   - **Source file**: The positioning file for each set of lines.
   - **Line Length**: Length of each line in the file.
   - **Line Azimuth**: Angle rotated around each position point.
   - **Lines Per Point**: Number of lines generated around each point in the source file.
   - **Pattern**: Choose a Search pattern or parallel offsets centered on each point.

     NOTE: If you choose the Offset pattern, enter an odd number of lines per point so your lines will be evenly spaced with one line across the position and an even number of lines on each side. If you enter an even number of lines per point, the program will generate an equal number of lines on either side of the point leaving a gap twice the size of the line spacing in the center.

   - **Line Spacing** is enabled only if you have selected the Offset pattern.

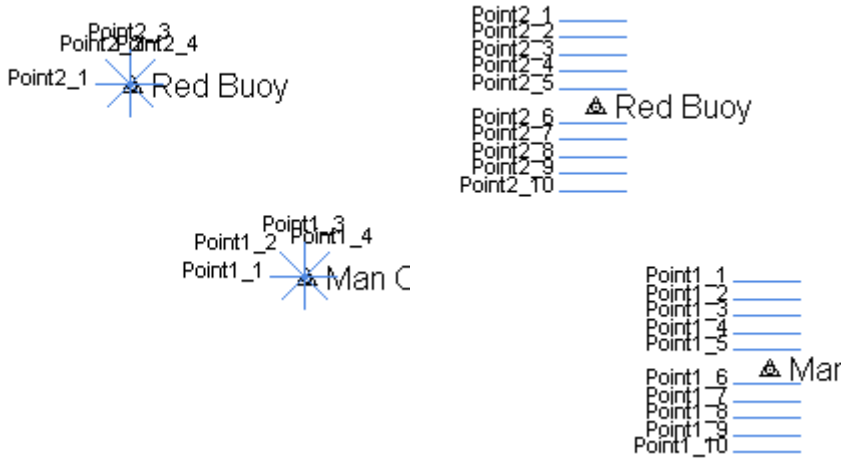
FIGURE 2-14. *Planned Line at Point dialog--Search Pattern (left) Offsets (right)*



5. **Click [OK].** The line sets will be generated all in one planned line file with line names in the format '*PointNumber_LineNumber*.LNW'

6. **Scroll to the top of the Lines list and delete the line named "1".** It has no points and is not part of the files generated at the locations read from your source file.
7. **Save your file** by selecting FILE-SAVE and naming your file. It will be saved, by default, to your project folder.

FIGURE 2-15. *Resulting Line File--Search Pattern (left) Offsets (right)*



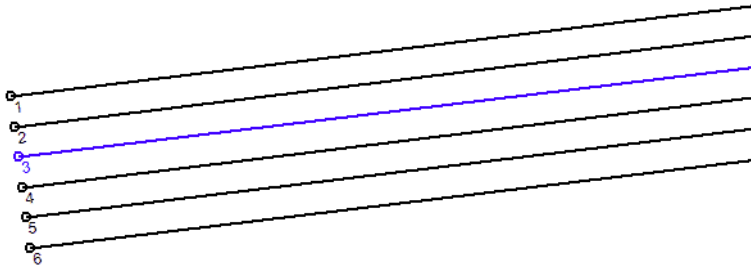
INSERTING EQUIDISTANT LINES WITHIN A LINE FILE

You can insert a user-defined number of survey lines between two adjacent lines in an existing planned line file. The Line Editor will calculate the required waypoint coordinates to distribute them evenly between the two existing lines using the same offset pattern. Line Editor generates unique numeric line names for the inserted lines.

To insert additional lines into an existing planned line file:

1. **Open the existing planned line file** in the LINE EDITOR.

FIGURE 2-16. *The Original Planned Line File*



2. **Hold the Ctrl key and use your cursor to select the two adjacent lines** between which you want to insert the additional lines.
3. **Right-click in the shaded space created by the selection and select "Add lines between 2 selections"**. A dialog will appear.

FIGURE 2-17. *Inserting lines in the LINE EDITOR*

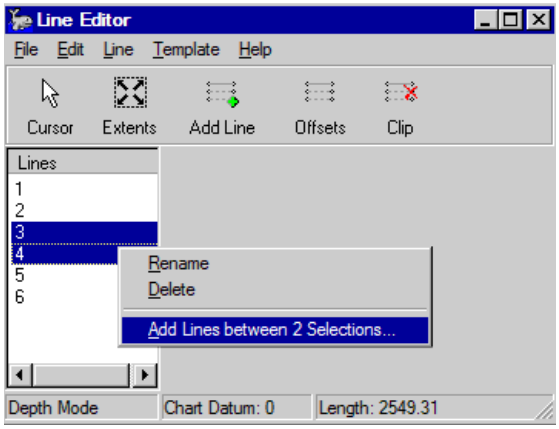
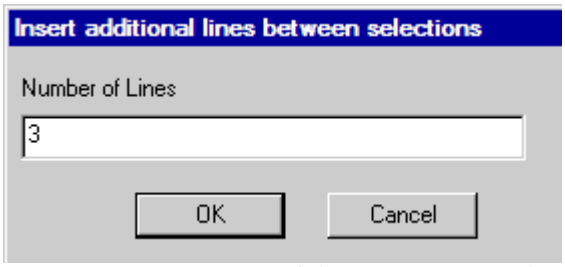
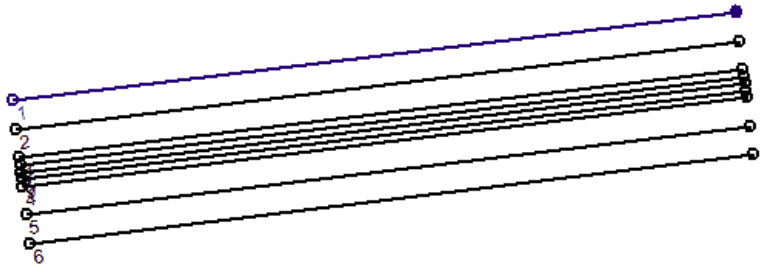


FIGURE 2-18. *Specifying the number of lines to be inserted*



4. **Enter the number of lines you want to insert and click [OK].** The lines will be inserted into the file. In this example, we began with six lines named by number. The inserted lines are named 7, 8 and 9. You may rename them manually, if you wish.

FIGURE 2-19. *Three Lines Inserted to a Line File with Parallel Offsets*



5. **Save your modified file**. Select FILE-SAVE to overwrite the original line file. Select FILE-SAVE AS to write the results to a new line file

EDITING YOUR PLANNED LINE FILE IN THE LINE EDITOR

You may edit a planned line file that has been created in the LINE EDITOR, at any time, by opening the LINE EDITOR and selecting FILE-OPEN and selecting the LNW from the file selection dialog. The saved data will appear in the spreadsheet where you can make your changes.

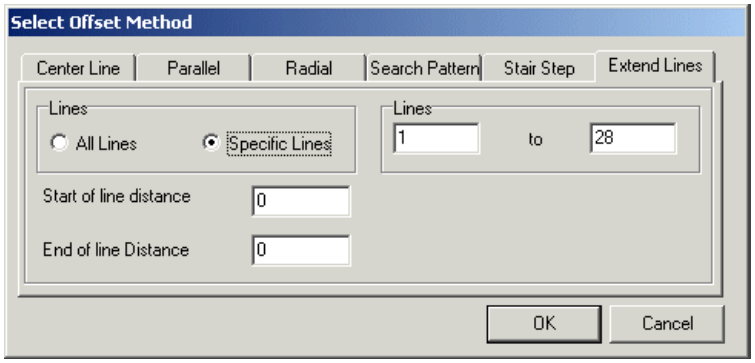
Many changes can be made either in the spreadsheet or by using the cursor in the area map. The following describes the editing operations available and instructions to do them in each mode.

If you have just used the automatic Offsets feature and are unsatisfied, and you have not yet closed the file, select EDIT-UNDO OFFSETS and try again. Continue to preview and edit until your lines are satisfactory.

Extend or shorten your lines at either or both ends. This enables you to expand your survey area and maintain the ability to do accurate historical comparisons with previous surveys.

1. **Open the line file** where you want to extend lines.
2. **Click the Offsets icon and select the Extend Lines tab**.

FIGURE 2-20. *Offsets – Extend Lines Tab*



3. **Select whether you want to extend All Lines or Specific Lines**.
4. **If you choose "Specific Lines", specify a range of lines** (by line number) to be affected. (The dialog default includes all of the lines in your file.)

   NOTE: These numbers usually correspond to the line numbers. However, if the line naming scheme is other than sequential numbering beginning at one, you should count the lines in the Lines list to determine how to describe the range of lines. For example, if you are extending the offsets in a center line pattern, the center line is "1", then the section lines begin, by default, at "0+00". If you specify a range of 5-15, the lines named "3+00" to "13+00" will be extended.

5. **Enter the distance that you want to extend the lines** at the start or end (or both) of the specified lines. (If you want to shorten your line, enter a negative distance.)
6. **Click [OK]** and the LINE EDITOR will move the start line point by the specified distance.

TABLE 2-2. *Editing Tools and Methods in the LINE EDITOR*

Task	Spreadsheet Method	Cursor Method
Add line	Click the Add Line icon then the Add point icon. Enter the waypoint position data.	Add Line icon then the Cursor icon. Click on the map at waypoint positions.
Delete line	Right-click on the line name of the line to be removed and select ‘Delete’.	
Insert a waypoint	Select waypoint below where the new point should be inserted and click the Insert Point icon. Enter the appropriate coordinates.	Select waypoint immediately before it on the line. (The circle will fill.) Hold the Shift key and click with the cursor at the new waypoint location.
Delete waypoint	Select the waypoint in the spreadsheet and click Delete Point icon.	Select the waypoint in the area map (it becomes solid filled) and push the delete key on keyboard.
Move a waypoint to a new position	Type new coordinates for the point you want to move.	Select the waypoint in the area map then drag it with the cursor to the new location.
Clip lines to survey area	(See “Clipping Planned Lines to the Survey Area”.)	
Rename lines	Right-click on the current line name, select ‘Rename’ and enter the new line name.	

More Information

“Clipping Planned Lines to the Survey Area” on page 2-80

CREATING 3-DIMENSIONAL PLANNED LINES IN THE LINE EDITOR

You can add channel template information to your planned line file through the options in the Template menu. This creates a 3-dimensional planned line file that can then be used to display the template during survey and dredging operations, and in the SINGLE BEAM EDITOR. It is also used to calculate volumes in the CROSS SECTIONS AND VOLUMES and the TIN MODEL programs.

You can use the Template tab as an alternative to the one provided in the CROSS SECTIONS AND VOLUMES program, then import the TPL file into the Template column of CROSS SECTIONS AND VOLUMES to describe alternate channel designs for calculations in that program.

1. **Create your channel templates.** Use the Template tab to create as many templates as you need to describe your channel. Each line can have a different template if necessary.
2. **If you are working in Elevation Mode or are using RTK positioning and have specified a Chart Datum**, apply your Chart Datum to your template by selecting TEMPLATE-ALL LINES-APPLY DATUM.

TIP: If you are in Elevation Mode, depths should be negative values. If you have entered positive values, select TEMPLATE-ALL LINES-INVERT DEPTHS.

3. **Apply the template** (or templates) to the lines that it describes.
4. When you have the correct template information applied to all of your lines, **save your planned line file** by selecting FILE-SAVE or FILE-SAVE AS and naming your file.

CREATING A CHANNEL TEMPLATE IN THE LINE EDITOR

1. **Select the line to which you want to add the template information** from the list on the left of the LINE EDITOR (click it to highlight it) and select the Template tab.

   The left side of the dialog contains a 2-column spreadsheet with 11 rows.

   NOTE *The channel template must contain 11 points*. This ensures that it will have the required information when it is used in the CROSS SECTIONS AND VOLUMES program. To create a simple channel, enter the left toe values to rows 3-5, and the right toe values to rows 7-9. (Enter the same values to each row in the group.)

   The area at the right draws the template as described in the spreadsheet using DBL as the horizontal axis and Depth as the vertical axis. This representation is also affected by the Elevation setting in your geodetic parameters.

   TABLE 2-3. *Depth vs Elevation*

Elevation Option is	Mode	Depth Measurement
Selected	Elevation	Negative downward
Not Selected	Depth	Positive downward

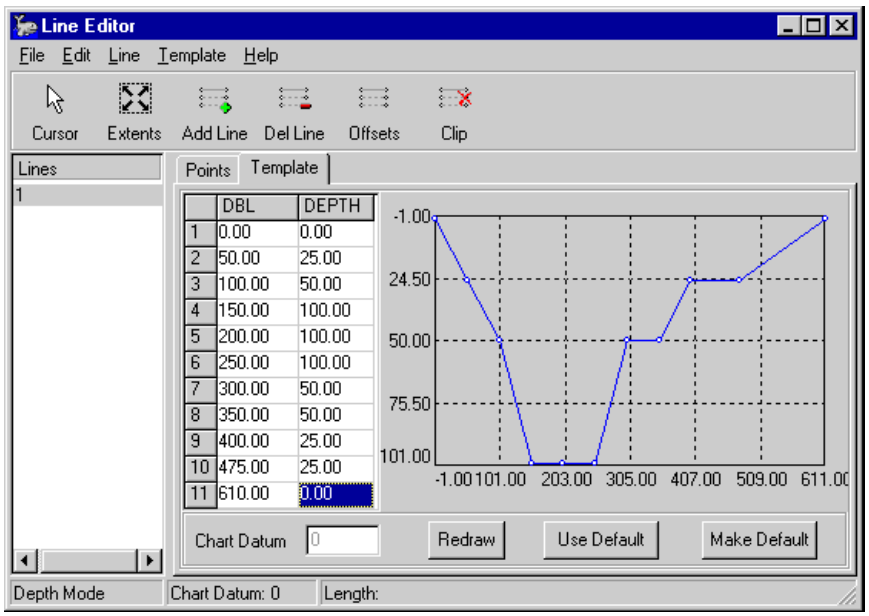
   The bottom of the dialog displays:

   - The **Chart Datum** to show you what has been set in your geodetic parameters. You must apply your Chart Datum to your template if you are working in elevation mode or using RTK positioning.
   - The **Line Length** to show you what the template length should be for that line.

2. **Describe the channel template** by entering the Distances from the Beginning of the Line (DBL), in order, and their corresponding depths to the spreadsheet. The graph on the right will draw accordingly. If the drawing on the right is incorrect, make changes in the spreadsheet to correct it.

   You can easily change the sign of your depth values by selecting TEMPLATE-ALL LINES-INVERT DEPTHS.

FIGURE 2-21. *The Template Editor draws the Template*



3. **Save the template information** (optional) by selecting TEMPLATE-SAVE CURRENT TEMPLATE and naming the template. Name it something that describes the template to help you recognize which line or series of lines it goes with. This will be saved to a template file (*.TPL) in your project directory.

   NOTE Saving the template to a TPL file is not required, but it may save you some time in applying templates to additional lines in your file. This file is then also available to use as a template file in CROSS SECTIONS AND VOLUMES.

APPLYING AND REMOVING THE CHART DATUM TO YOUR TEMPLATE

Apply the chart datum by selecting TEMPLATE-ALL LINES-APPLY DATUM. The depths in the spreadsheet will be recalculated (depth + datum) and the vertical axis on the graph will be labeled accordingly.

Remove the chart datum from your template, select FILE- ALL LINES -REMOVE DATUM.

APPLYING THE TEMPLATE TO THE SURVEY LINES

When you create a template, the template you just created is now applied only to the line that was selected when you created the template. The next

step is to apply the template to any other lines that have the same template.

The **Default Template** makes it quick and easy to apply the same template information to multiple lines. Once you have defined a template, you can store it to temporary memory by clicking [Make Default]. You can then apply that template to one or more additional lines.

- **To apply the default template to one line**:
  a. **Select the line** to which you want to apply the template.
  b. **Select TEMPLATE-USE DEFAULT TEMPLATE.** The template that was last set as the default will be applied.
- **To apply the default template to all lines** select TEMPLATE-ALL LINES- USE DEFAULT TEMPLATE.
- **To apply template other than the default:**
  a. **Type new template information** for the line into the Template tab.
  b. **Select TEMPLATE-LOAD TEMPLATE** and select the required TPL file. (You must have previously entered the information and saved it using TEMPLATE-SAVE CURRENT TEMPLATE.)

Changing the Default Template

Unless you have a very simple channel, you will have multiple templates in your channel. As you apply template throughout your channel, from time to time, you may need change which is the default. You can:

- **Copy it from a line.** Select a line that already has the new template attached and click [Make Default] (or select TEMPLATE-MAKE TEMPLATE DEFAULT).
- **Copy it from a TPL file.** If the new template has already been defined and saved to a TPL file, select a line where you want the new default template applied, then select TEMPLATE-LOAD TEMPLATE and the template file. Click [Make Default] to set it as the new default.

Removing the Template from Survey Lines

To remove the template information from individual lines, select the line then select TEMPLATE- CLEAR TEMPLATE.

To remove the template information from all of the lines, select TEMPLATE-ALL LINES-CLEAR TEMPLATE.

Example of Applying a Channel Template in the Line Editor

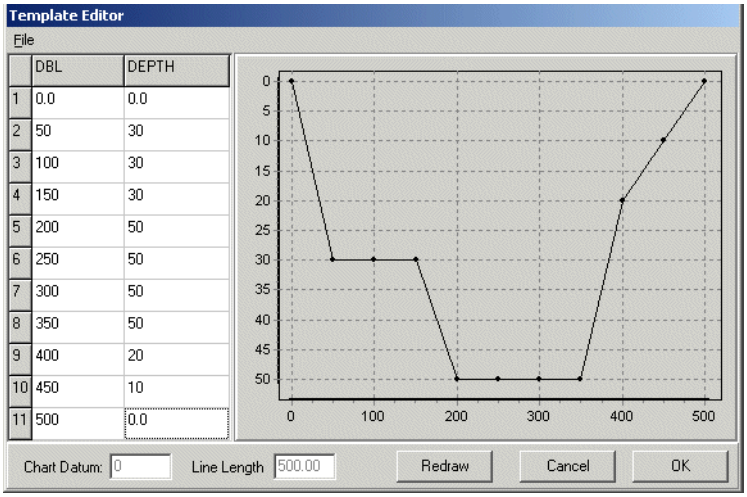
Create a planned line file named Manual Ex3.lnw using a center line pattern as in example1. Create a template using the following data and name it Manual Ex3.TPL. Apply it only to the cross lines.

TABLE 2-4. *Channel Template Specifications*

DBL	0	50	100	150	200	250	300	350	400	450	500
Depth	0	30	30	30	50	50	50	50	20	10	0

1. **Follow the procedure from example 1** to create the center line planned lines.
2. **Go to the Template tab.**.
3. **Describe your template by entering the DBL and Depth values** into the spreadsheet portion of the editor. As you enter the data, the graph will draw on the right accordingly.

FIGURE 2-22. *The Template Editor Draws the Template*



4. **Save your template data** by selecting FILE-SAVE and naming it Manual Ex3.TPL.
5. **Designate this template as the default** by clicking [Make Default].
6. **Apply the template to all of the lines in your file.** Select TEMPLATE-ALL LINES-USE DEFAULT TEMPLATE. Well that's great except the center line doesn't have that shape!
7. **Remove the template from the center line** by selecting the center line (click on the line name at the left) and selecting TEMPLATE-CLEAR TEMPLATE.
8. **Save your line file** by selecting FILE-SAVE and naming your file Manual Ex3.lnw.

NOTE You could also select one of the cross lines, create the template, then apply the template to each cross line individually. This method would avoid applying an incorrect template to the center line, but it would take a lot longer.

APPENDING LINE FILES

You can append one existing Line File to another in the LINE EDITOR.

1. **Open or create a Line File** in the LINE EDITOR.
2. **Select FILE-APPEND** and a file selection dialog will appear.

3. **Choose the second Line File and click [OK].** The second file will be appended to the end of the first. When the Line Editor combines the two files, it checks for duplicate line names. If there are duplicate line names in the appended file, the LINE EDITOR appends an "_1" to the name. If that name already exists, the LINE EDITOR appends an "_2". LINE EDITOR will continue incrementing the number after the underscore until it creates a line name that is unique to the file.
4. **Preview the results** by clicking the Extents icon.
5. **Save your file.** FILE-SAVE will overwrite the original line file. FILE-SAVE AS will enable you to assign a new name to the combined file.

CREATING WAYPOINTS USING DISTANCE AND BEARING

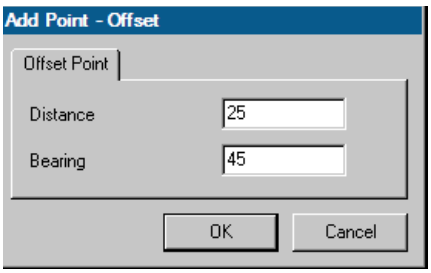
You can extend the end of a survey line by adding a waypoint based on distance and bearing information instead of waypoint coordinates.

1. Define the coordinates of at least one waypoint in a survey line. You can enter it manually or use the cursor method.

FIGURE 2-23. *Initial Survey Line*

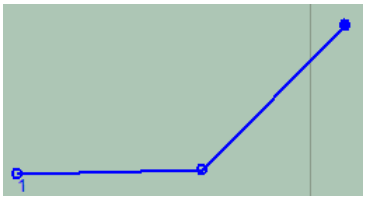
2. Click the Offset Icon from the lower toolbar. A dialog will appear.

FIGURE 2-24. *Offset Point Dialog*



3. Enter the distance and bearing from the last waypoint in the line to the end point of your extension and click [OK]. The LINE EDITOR will calculate the position and automatically append the coordinates as the last waypoint in the line.

FIGURE 2-25. *Survey Line Extended 45 Survey Units at a Bearing of 45 Degrees*



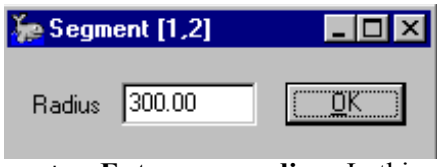
CREATING CURVED LINES WITH THE LINE EDITOR

Curved survey lines will be defined in HYPACK® as any survey line containing one or more arched segments connecting their defining points.

Curved lines, in most cases, can be used in the same manner as straight-segmented, 2-dimensional lines. However, they cannot be read in CROSS SECTIONS AND VOLUMES.

1. **Create your initial line** as you would with straight lines. Typically, you define the initial line by entering a few points, using either the cursor or spreadsheet method. These points will automatically be connected by straight segments.
2. **Add curvature to any segment of the line as needed**.
   a. **Click on the shaded area in the first column of Line Editor between the points where you want the curve to occur**. It will open a dialog box prompting you to enter a radius for the selected segment.

FIGURE 2-26. *Specifying the radius of your arc*



   b. **Enter your radius**. In this example, we alternated 300 and -300.
      - Enter any number in the radius dialog that is, by absolute value, greater than the half-length of the segment. Otherwise the arc is not going to be created.
      - A positive or negative radius determines that the center point of the arc will be right or left of the segment respectively.
   c. **Create your offsets as normal**. All offset patterns can be used with curved lines (some with more useful result than others).

You will easily recognize the curved segment in the Line Editor by the shaded rounded areas in the first column. In the following figure, the segment between the second and third waypoint is curved.

FIGURE 2-27. *The Line Editor signifies a curved segment with a rounded shaded area.*

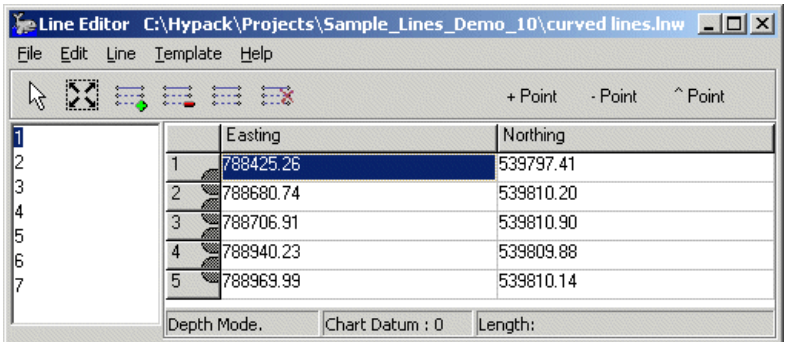
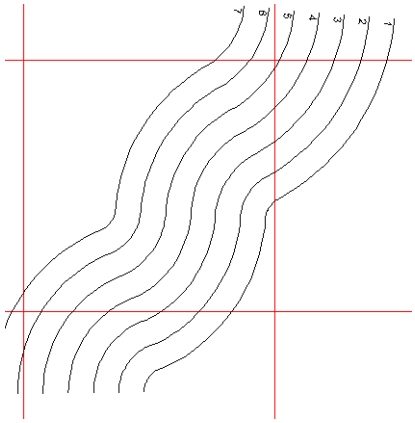


FIGURE 2-28. *Curved parallel lines—four consecutive curved segments*



NOTE The Clip Lines option does not support curved lines. It will clip curved segments, as if they were straight.

IMPORTING *.LIN AND *.N83 FILES TO THE LINE EDITOR

If you have a DOS Line file (*.LIN) or a Trimble Line file (*.N83), you can import it into HYPACK® through the LINE EDITOR.

1. **Select FILE-OPEN** and a file selection dialog will appear.
2. **Specify the file type then the file you want to import**.
3. **Save the file** in LNW format.

Your file will be saved as an LNW file which may be used in the other modules of HYPACK®.

CREATING PLANNED LINES IN CHANNEL DESIGN

The CHANNEL DESIGN program you can create a planned line file that contains the channel cross section template information for each line.

Enter the channel information (toe line, center line, basin information and side slope, etc.) and store it as a channel plan (*.PLN) file.

From the channel plan, you can do the following:

- **Create planned line files** that include the template information.
- **Create channel files** (*.CHN).
- **Display PLN and CHN files** in HYPACK®, SURVEY, DREDGEPACK® and 3DTV to show channel limits in real time during data collection.
- **Display channel template information from the data file header in the** SINGLE BEAM EDITOR profile window.

- **Calculate the volume of material between the survey surface and the channel template** in CROSS SECTIONS AND VOLUMES and TIN MODEL.
- **Plot the channel plan and channel template** in HYPLOT to show the channel limits.
- **Export the channel plan and channel template** to DXF format and display them as a background file to show channel limits.

The default location for all of the files generated in CHANNEL DESIGN is in the current project directory.

More Information

- "Profile Window Display Settings in the Single Beam Editor" on page 4-36
- "Loading Pre-existing Template Data" on page 7-38
- "TIN-to-Channel Calculations" on page 7-155
- "Running HYPLOT" on page 7-2
- "Running the Export Program" on page 7-180

RUNNING CHANNEL DESIGN

1. **Start the program** by clicking PREPARATION–PLANNED LINES-CHANNEL DESIGN or the CHANNEL DESIGN icon.
2. **If your design includes curved lines, check the 'Enable Arcs' option** in the General tab.
3. **Enter your Center Line** information. Once you have entered your XY coordinates, CHANNEL DESIGN can automatically calculate the chainage[1] values for you. If you have enabled arcs, you must also enter the arc radius for each curved segment.
4. **Enter your toe line and turning basin[2] coordinates** and side slope information. If you have enabled arcs, you must also enter the arc radius for each curved segment.
5. **Set your channel parameters** in the General Tab.

NOTE: At this point, you can save the data entered to a PLN file, which can be used to reload the same data to CHANNEL DESIGN at a later time. A PLN saved at this point in the process cannot be displayed in HYPACK® or SURVEY.

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6. **Click [Generate] to create your planned lines**.
7. **Preview your lines** in 2D View, 3D View and Section windows.

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1. **Chainage:** The linear distance along the center lineat each center line point.
2. **Turning basin** :An area located to the side of the main channel that is at a different depth than the main channel.

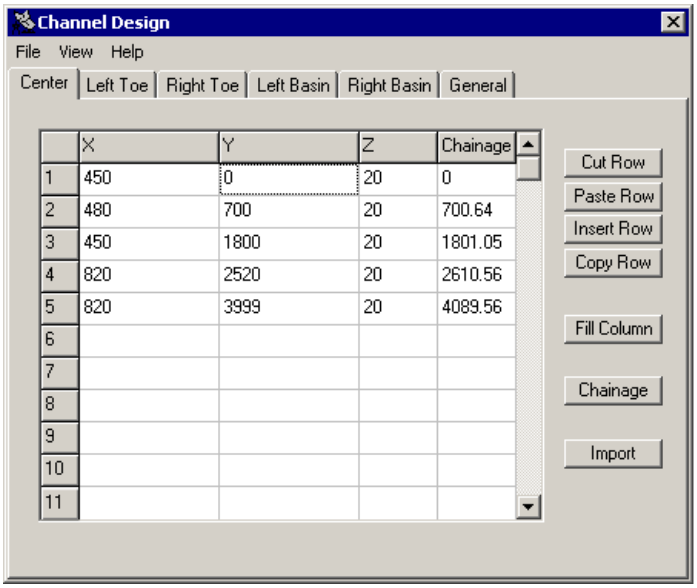
8. **Manually adjust lines if necessary**. Keep in mind that doing so will make exact replication of the line file (even using the same PLN file) nearly impossible.
9. **Set which lines will be included in the LNW file**.
10. **Save your information to:**
    - A channel plan (*.PLN) file.
    - A planned line (*.LNW) file.
    - An advanced channel (*.CHN) file.

You can re-open any file created in CHANNEL DESIGN by selecting FILE-OPEN PLN and selecting the *.PLN file from the file selection dialog. You can edit the data if you wish and save it by again selecting FILE-SAVE.

ENTERING YOUR CENTER LINE COORDINATES AND CHAINAGE IN CHANNEL DESIGN

1. **Click on the Center tab** to access the spreadsheet that will contain your center line information.

FIGURE 2-29. *Center Line Coordinates in Channel Design*



2. **For each waypoint along your center line, enter the X and Y-coordinate and the depth value (or elevation value).** The X and Y values represent the grid coordinate values. You cannot enter Latitude-Longitude pairs in the CHANNEL DESIGN program.

NOTE If channel depth changes along center line, make a center line waypoint on each side of the transition area, then use the Generate Line at Corners option to get a line on each side of the transition.

3. **If you have enabled arcs in the General tab, enter the radius of each segment.** An additional column is included for this purpose. The arc should be greater than half, but no more than the total distance between weigh points. A positive radius arcs left and a negative radius arcs right as you look from the start of line toward the end.
4. **Calculate the chainage** (linear distance along the center line). The [Chainage] button is used to compute the chainage from the current cursor position to all subsequent waypoints in the channel.
   a. **Enter the chainage value for the first point in your center line** list.
   b. **Click [Chainage].** The chainage for all subsequent points will be computed.

[Cut Row] removes a row from the spreadsheet and copies it to the clipboard.

[Paste Row] copies the current row from the clipboard back into the spreadsheet.

[Insert Row] creates a blank row above the current cursor position.

[Copy Row] copies the coordinates from the current cursor position to the clipboard.

[Fill Column] is normally used to copy the Depth entries from the current cursor position to the last filled cell in the spreadsheet. It can also be used to copy X or Y coordinates in the same manner.

[Import] extracts X-Y values from an X-Y, X-Y-Z or HYPACK® LNW file.

- **For data in X-Y or X-Y-Z format**, it will extract the first column as the X-value and the second column as the Y-value and ignore all other columns.
- **For a HYPACK® LNW file**, the program expects to read an LNW file that has only a single planned line and it will extract the X-Y values from this planned line into the selected spreadsheet.

Entering Toe Line and Turning Basin Information in Channel Design

The **toe** is the outside edge of the channel floor where the channel walls begin sloping upward to the top of bank.

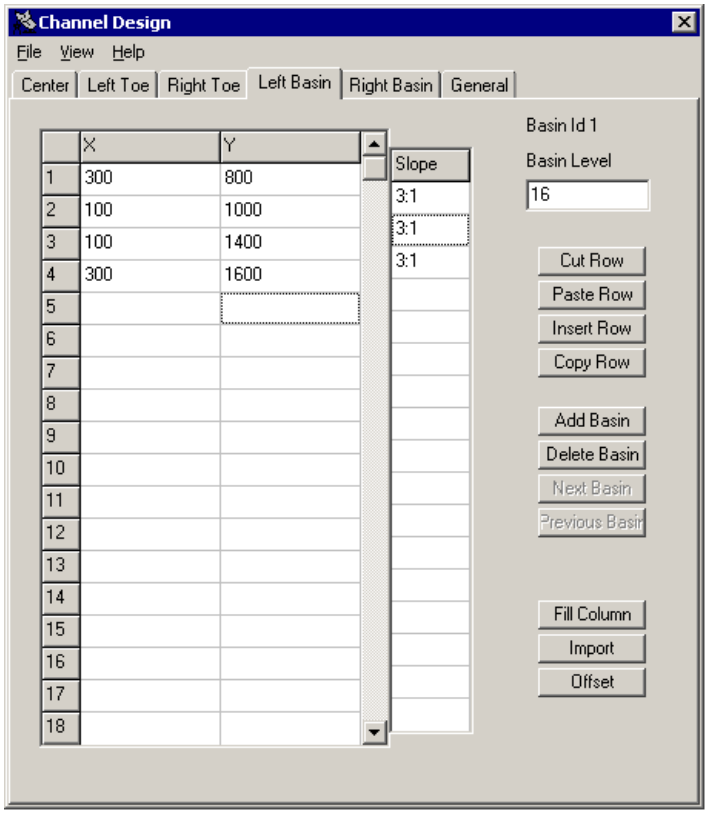
A **turning basin** is an area located to the side of the channel that is designed at a different depth (usually shoaler) than the main channel.

FIGURE 2-30. *Defining the Left Toe*

The Left and Right Toe tabs list coordinates for the points that define the left and right toes. Likewise, the Left Basin and Right Basin tabs define any turning basins in your channel. All coordinates are XY grid coordinates. You cannot enter Latitude-Longitude pairs in the CHANNEL DESIGN program.

If your channel includes turning basins, the toe crosses the mouth of the turning basin while the turning basin extends outward from the toe. The end points of the turning basin must be included in the list of toe line coordinates. In the left figure, you will define the left toe line as A-B-E-F and the turning basin as B-C-D-E**.**

FIGURE 2-31. *Entering the Turning Basin*



The **Slope** is the horizontal to vertical ratio of the side slope. Enter the slope for each pair of coordinates in the field to the right of each pair. For example, if your side slope extends 25m horizontally and goes from a depth at the toe of 10m and a depth at the top of bank of 0m, you would enter 2.5 as the Slope value.

NOTE: Use a slope of 0.01 for vertical walls.

- **The transition from the main channel up to the turning basin** is computed based on the side slope, entered in the spreadsheet for the adjoining Toe (in this example, B and E in the Left Toe spreadsheet).
- **The transition from the basin area up to the top of bank** is computed based on the Slope information entered in the Basin spreadsheet.

If you have enabled arcs in the General tab, enter the radius of each segment. An additional column is included in each of the other tabs for this purpose. The arc should be greater than half, but no more than the total distance between weigh points. A positive radius arcs left and a negative radius arcs right.

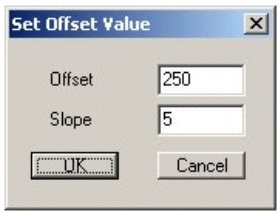
When entering toe information:

The **Toe Shift** is used in rare instances where the depth of the toe line is shoaler than the depth at the center line (V Channel). Enter the amount by which the toe is shoaler. For example, if the center line design depth is

10m, but the left toe line design depth is 8m, you would enter 2 as the Toe Shift.. The default Toe Shift is 0.

Offset can be used to create a toe line and side slope that are a fixed distance from the center line. Once the center line information has been entered, you can go to the Left Toe tab and click [Offset]. The Set Offset Value dialog appears. The settings in the following figure, would create a toe line that is 250m (or feet for foot grids) left and parallel to the center line and that the side slope for the left toe would be 5:1 (horizontal:vertical).

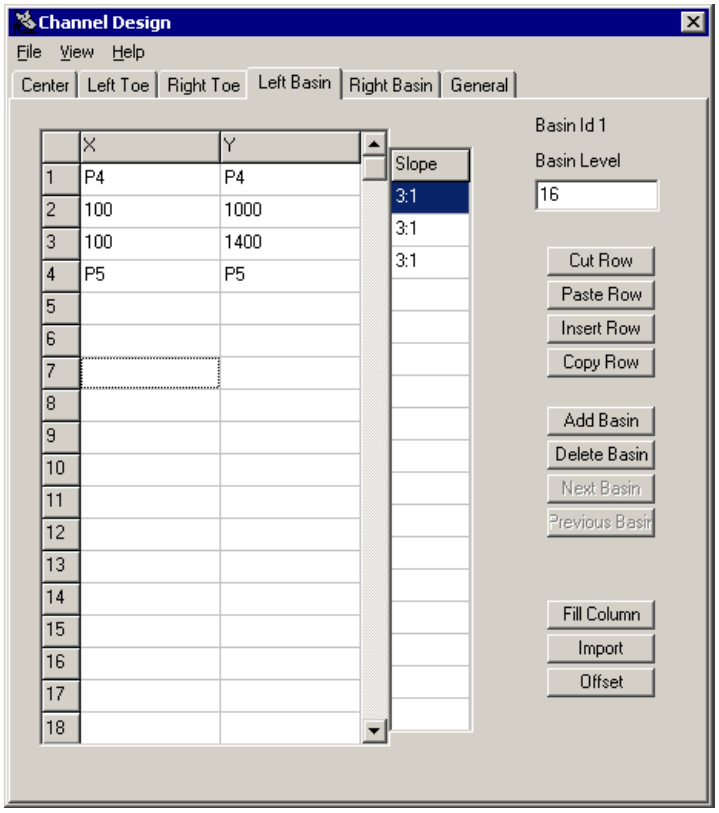
FIGURE 2-32. *Creating Toes Parallel to the Center Line*



When entering turning basin information:

When you enter the X and Y values for the turning basin line in the spreadsheet, you can either enter the actual coordinates or, the point number as is listed in the toe line list. For example, enter P2 for the second point in the toe line list or P3 for the third point in the toe line list.***Turning Basin Shorthand***

FIGURE 2-33. *Turning Basin Shorthand*



The **Basin Level** defines the depth (or elevation) level of the basin area. Basins must be at a z-level different than the main channel.

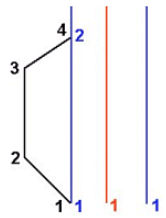
[Add Basin] is used if you have more than one basin along a left or right toe line. Once you click [Add Basin], you can navigate from basin to basin by clicking [Next Basin] or [Previous Basin].

The current **Basin ID** will be displayed in the top right of the Basin window above the Basin Level text box.

[Delete Basin] removes the current basin.

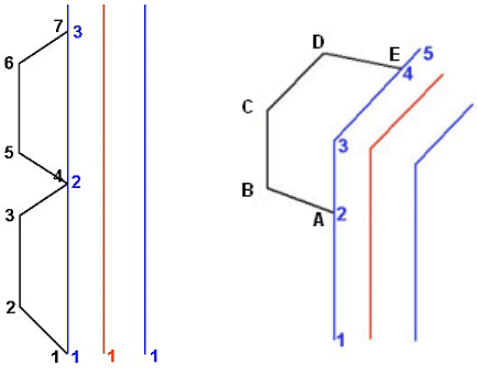
Rules for Turning Basins

FIGURE 2-34. Rule #2



1. The first and last point in a turning basin must be included in the toe line list.
2. **A Basin cannot begin or end at the first or last toe point.** The turning basin in the following figure would be illegal. You could make it legal by adding a left toe point just before the 1 point.

FIGURE 2-35. Rule #3 (left), Rule #4 (right)

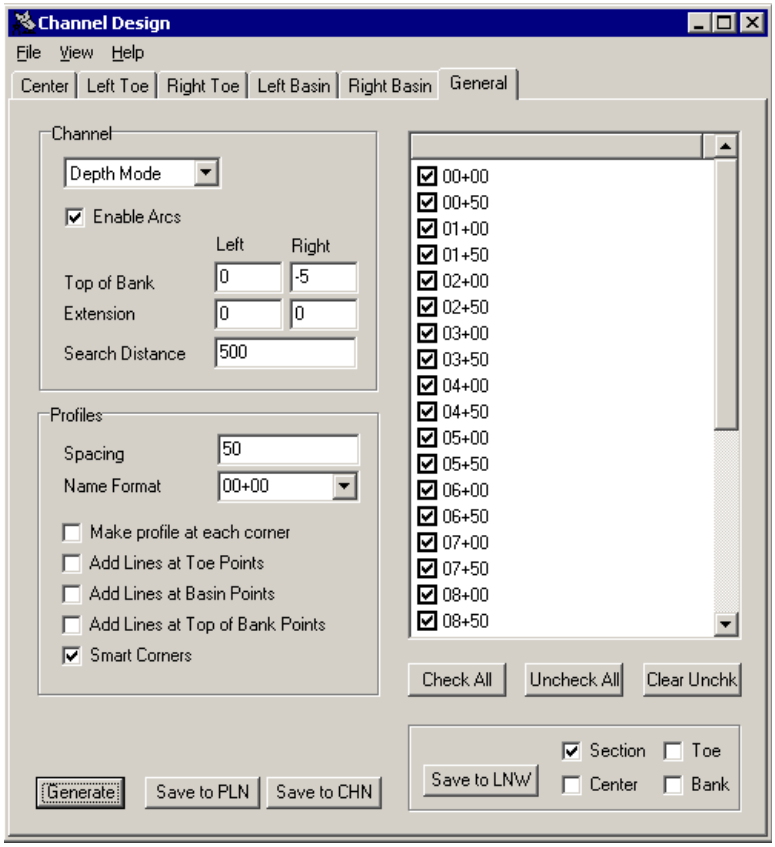


3. **Two Basins** cannot **end and start at the same toe point.** The basins in this figure would be illegal, because the first basin ends at toe point 2 and the next basin begins at the same toe point.
4. **Basins can now be located about turns in the toe line.** The toe line is defined by points 1-2-3-4-5 and the left basin is defined by points A-B-C-D-E. Toe line point 2 has the same coordinates as basin point A and toe line point 4 has the same coordinates as basin point E.

Setting your Channel Parameters in Channel Design

The options in the General tab provide a lot of flexibility to customize your planned lines and channel information to your needs.

FIGURE 2-36. *CHANNEL DESIGN—General Tab*



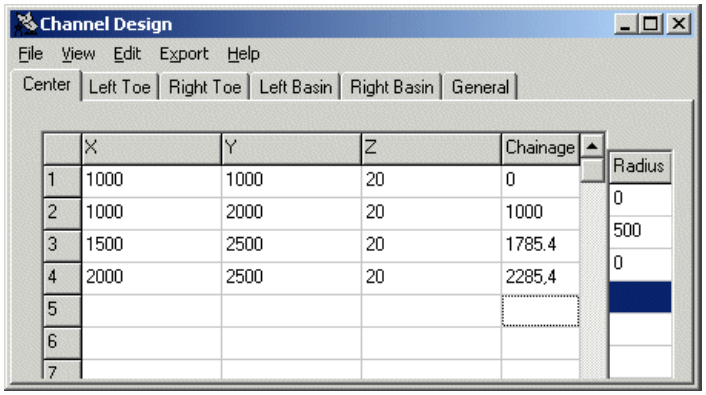
Mode toggles between Depth (Z is positive downwards) and Elevation (Z is positive upwards) modes.

Enable Arcs is checked if you plan to have curved toe line, center line or basin lines. In the following example, we have checked the Enable Arcs check box.

Once the Enable Arcs has been activated, the spreadsheet windows are modified to allow you to enter the radius for a segment.

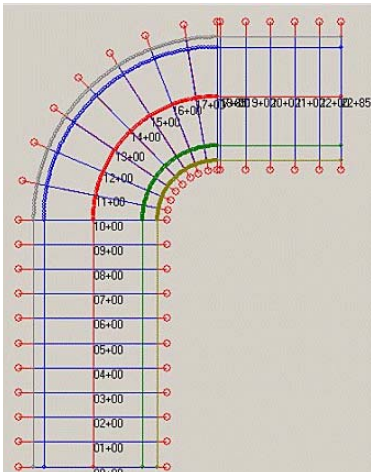
In the following example, center line points 2 and 3 will be connected by an arc created using a 500m (or foot for foot-based grids) radius between the two points. You may enter positive or negative radii values. Positive values create an arc that runs clockwise around a circle. Negative values create an arc that runs counter-clockwise around a circle.

FIGURE 2-37. *Entering the Curve Radius*



In the following example, the center line had a radius of 500m. The left toe line was located 200m outside the center line, so it had a radius of 700m. The right toe line was located 200m to the inside of the center line, so it had a radius of 300m.

FIGURE 2-38. *Curved Center Line and Toe Lines*



Top of Bank defines the level for the Left and Right banks. In the original CHANNEL DESIGN program, the Top of Bank was always assigned at Z=0.0.

In CHANNEL DESIGN, it is possible to set the top of bank at any value. For example, if you wanted to extend the top of bank 5m above the chart datum and you were working in Depth Mode, you would enter -5.0 as the Level. The Left Top of Bank value is independent from the Right Top of Bank value.

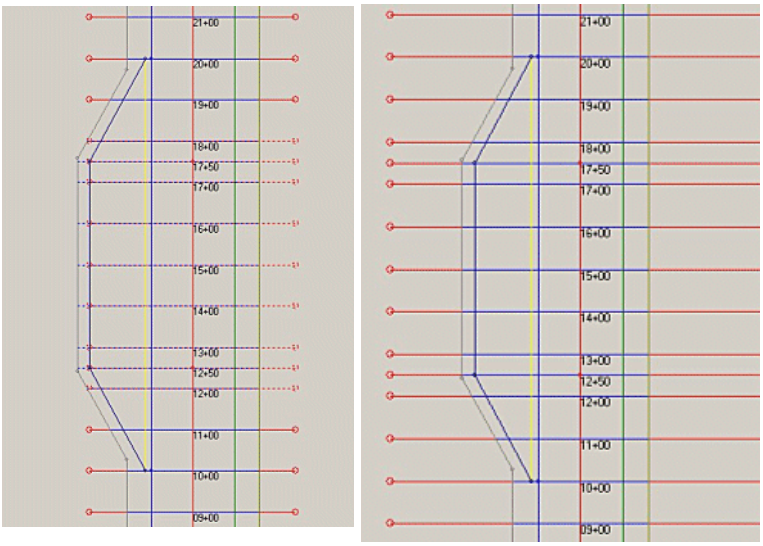
Extension extends the planned lines beyond the intersection with the top of bank. If you enter 100, it will extend your lines 100m (or feet for foot grids) beyond the intersection point of your planned line and the top of bank line.

Search Distance defines the distance from the center line the program should search when looking for the intersection between the planned line

and the top of bank line. The distance should be set so that the program can effectively search the range from the center line outward to the most distant point.

- **If the search distance is too short**, the program will not find the limits of the left turning basins top of bank and it will draw these lines as dashed lines in the 2D viewer. This is a warning that you should increase the Search Distance. (The distance between the center line and the red circle at the end of each line represents the current search distance.)
- **If the search distance is long enough**, the program can determine the intersections for all of the planned lines and top of bank lines. All survey lines will be drawn as solid lines in the 2D Viewer and you can save your results to a planned line file (LNW).

FIGURE 2-39. *Search Distance is too short (left) and long enough (right) to find the toe.*



The Search Distance also affects the rotation of lines when the Smart Corners option is selected. Where survey lines cross, Smart Corners adjusts the rotation to eliminate the intersections.

A good rule of thumb for the Search Distance is to set it large enough so that all of the top of bank lines can be found, but not so large that more lines than necessary overlap beyond the toes. In these cases, Smart Corners tries to rotate lines it doesn't have to rotate.

Spacing equals the distance between lines along the center line. If you have a curved center line, the program will compute the distance along the curve. Planned lines always pass through the center line at the exact spacing increment.

Name Format allows you to determine how the lines will be named. Each line receives a name, based on the chainage value where the planned line intersects the center line. Current options are:

- 00+00

- 0+000
- 0+0000
- MI_00+00

The first three choices are just engineering notation where a + character is inserted after the tens, hundreds or thousands. The last choice (MI_00+00) is based on the USACE Portland River Mile naming protocol. If you select this option, you will have to enter how many feet (or meters) per river mile. The default is 5280. The program then names each line based on the last river mile marker and the distance along the center line from that mark to the current line.

In addition to creating perpendicular lines at fixed intervals along the center line, CHANNEL DESIGNprovides several modifications.

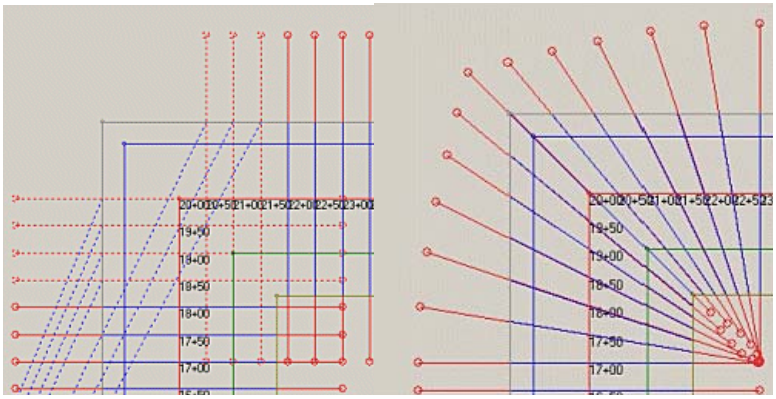
- **Make profile at each corner** generates a planned line at each center line waypoint.
- **Add Lines at Toe Points** generates a profile line at each waypoint in the toe line.
- **Add Lines at Basin Points** generates a profile line at each waypoint in the basin line.
- **Add Lines at Top of Bank Points** generates a profile line at each waypoint in the top of bank line.
- **Smart Corners** rotates lines about the intersection of the planned line and the channel center line so that the line does not intersect with any other planned line. This will generate the most accurate results when computing volumes in the CROSS SECTIONS AND VOLUMES program.

NOTE: Keep your Search Distance as short as possible to avoid excessive line rotations.

In the following figure, the image on the left shows Smart Corners disabled. The program attempts to create all lines perpendicular to the channel center line. For lines 18+50 to 20+00, it cannot find a right toe line and the lines are dashed. For lines 20+50 to 21+50, it cannot find a right toe line so the lines are dashed. Saving this collection of lines will result in large errors in the LNW file and when computing volumes in CROSS SECTIONS AND VOLUMES.

In the image on the right, Smart Corners was enabled. Beginning with line 17+50 and ending at line 22+50, it has proportioned the lines about the turn so that the planned lines do not intersect. This will give the best results when computing volumes in the CROSS SECTIONS AND VOLUMES program and in the TIN MODEL program.

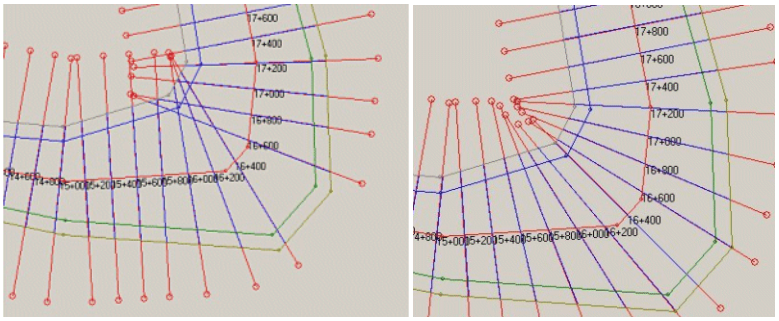
FIGURE 2-40. *Smart Corners—Disabled (Left) Enabled (Right)*



Sharp turns may cause problems that Smart Corners cannot overcome. In this case, you can manually rotate the lines in the 2D View window.

In the 2D View below left, we have a sharp corner where the lines currently intersect. We can manually fix this by holding down the Ctrl key and using the mouse to click on one end of the line and manually drag it to its new orientation. The 2D View shown below on the right shows the same corner after we have manually rotated several of the lines about the turn.

FIGURE 2-41. *Manually Correcting Crossed planned lines in the 2D View*



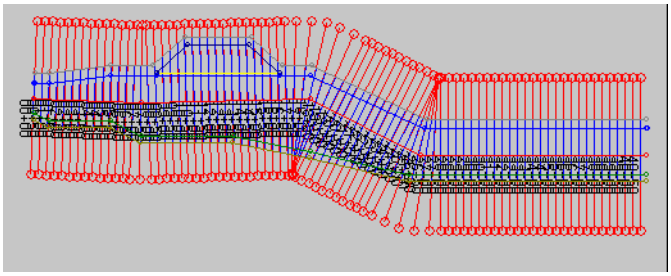
The only trouble with manually rotating lines is that it is next to impossible to reproduce the exact results in a separate session of CHANNEL DESIGN. Given the same PLN file as a starting point, two users will probably produce LNW files that are slightly different going around the corner if they manually adjust the rotations.

PREVIEWING YOUR PLANNED LINES IN CHANNEL DESIGN

The View menu offers options to preview the survey lines and channel that you have described. A list of short-cuts can be displayed by selecting HELP-SHORTCUTS and the tab corresponding to the view you want to adjust.

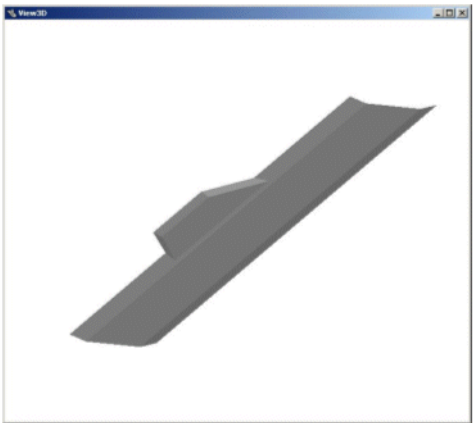
2D View allows you to examine the planned lines that have been generated and to manually rotate the planned lines. The shortcuts can be used to scale the screen.

FIGURE 2-42. *2D View*



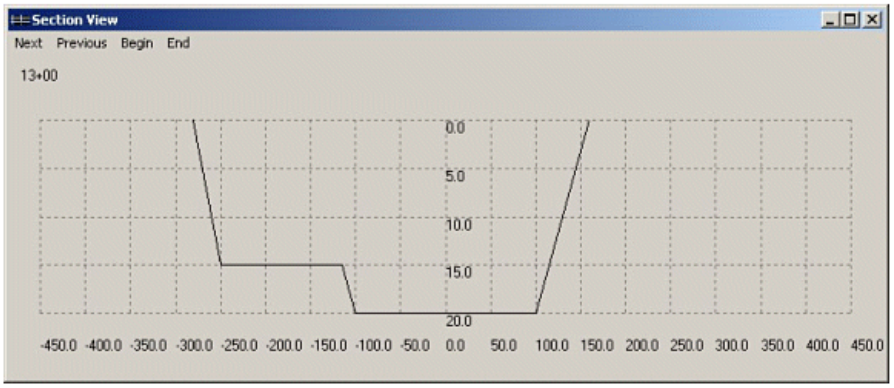
3D View draws the channel described. User controls are available to change the 3D rotation, scale and exaggeration of the vertical.

FIGURE 2-43. *3D View*



Sections displays each generated cross section profile. Keyboard commands are available to adjust the graph display.

FIGURE 2-44. *Sections View*



Saving your Survey Lines and Channel Information in Channel Design

A list of lines will appear in the right side of the General tab with a check box enabled for each line. Clearing the check box means the line will not be included when you save the results to a planned line (*.LNW) file.

[Check All] enables all lines.

[Uncheck All] button disables all lines.

[Invert] switches the check status for all lines.

[Save to PLN] saves all of the channel geometry and CHANNEL DESIGN settings to a new-style Channel Plan (*.PLN) file.

Note: The PLN format has been updated in Version 4.3 to include all of the parameters specified in the General tab, and to allow fields for arc distances. CHANNEL DESIGN is capable of reading both the old PLN and the new PLN formats. The old CHANNEL DESIGN program is only capable of reading the old PLN format. This means that PLN files created in CHANNEL DESIGN cannot be read into the older version.

[Save to CHN] saves the channel geometry to an Advanced Channel (*.CHN) file. These files can be used to take real time cross sections in DREDGEPACK® or to compute volumes in the TIN MODEL.

[Save to LNW] saves the checked lines to planned line (*.LNW) format. Each line will have the channel template information saved with the planned line coordinates. The template can be used and displayed in:

- The Profile window of SURVEY
- The Profile window of the SINGLE BEAM EDITOR
- CROSS SECTIONS AND VOLUMES

Next to [Save to LNW] are check boxes. The program will create planned line(s) for each item that is checked.

- **Sections:** You should always check Sections, as that is why you ran the program.
- **Center** would add a line to the file that runs along the Center line waypoints as entered in the CHANNEL DESIGN spreadsheet.
- **Toe** and **Bank** would create planned lines that run along the toe lines and the top of bank lines.

Creating A Planned Line File from a DXF or DGN File

The Export to Line File routine is used to create HYPACK® planned line files from DXF or DGN files that meet certain requirements. You may

choose to also include channel template information in the resulting planned line files. The exported LNW files may then be loaded to a project to guide you during your survey or in programs where LNW files are used for processing your sounding data.

DXF or DGN structure requirements:

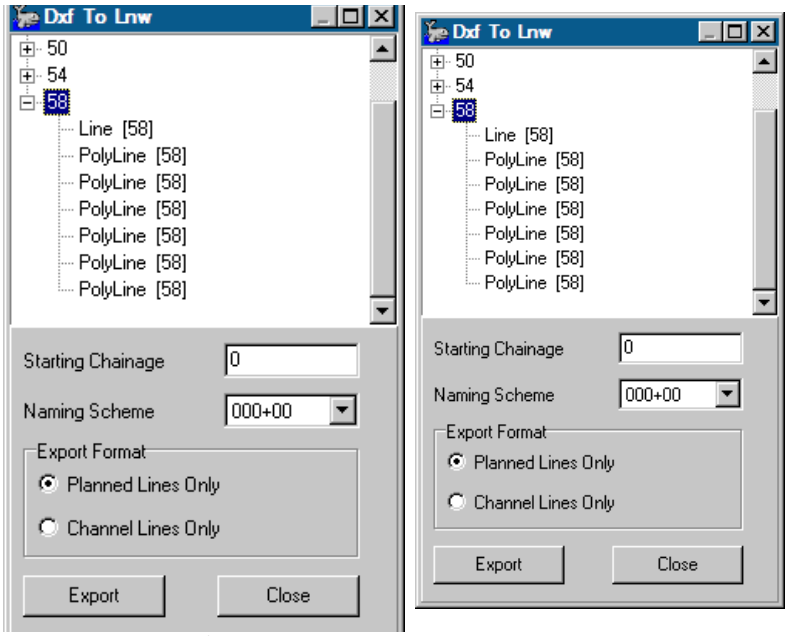
- Definesonly a simple channel.
- All channel elements must be 3D polylines.
- Channel information is defined by 5 lines representing the top of the slopes (left and right), the toe lines (left and right) and the center line. Each of these lines will occupy a different layer of the file. Channel information will only be assigned to single-segmented lines.
- All planned lines should be a standard AutoCAD Line file.
- Planned lines can be straight or multi-segmented. Curved lines are not supported.
- All planned lines must occupy the same layer in the file and there is no limit to the number of lines in the file.

Once you have your DXF or DGN that complies with the above specifications, the rest is easy.

1. **Load the DXF or DGN file to your project**.
2. **Right-click on the file in the Project Files List and select Export to Line File**. The DXF To LNW Dialog or DGN To LNW will appear according to the type of file you have selected.

NOTE: HYPACK® can only export 2-dimensional lines from DGN files.

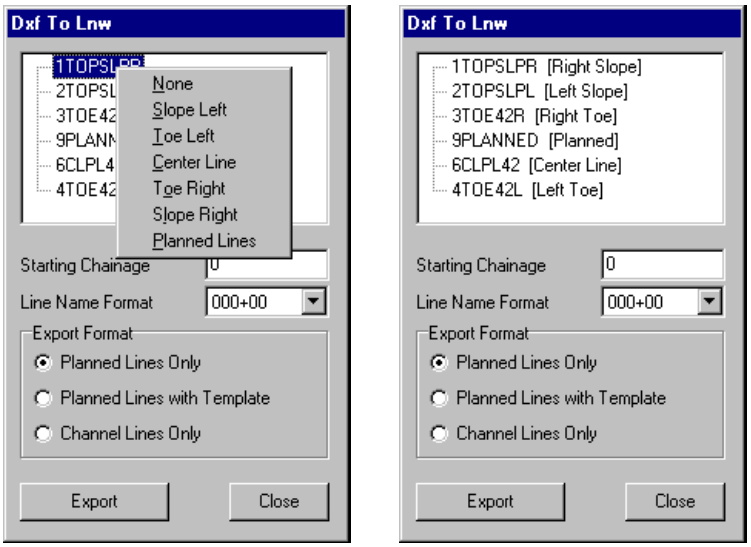
FIGURE 2-45. *Selecting Your Layers--DXF to LNW (left), DGN to LNW (right) does not support lines with template information*



3. .**Make layer assignments**.

a. Right-click a layer (or level) containing the planned lines or a channel line to bring up a menu of assignment choices.
b. Click on the correct assignment for the chosen layer; it will be displayed to the right of the layer name in the dialog.

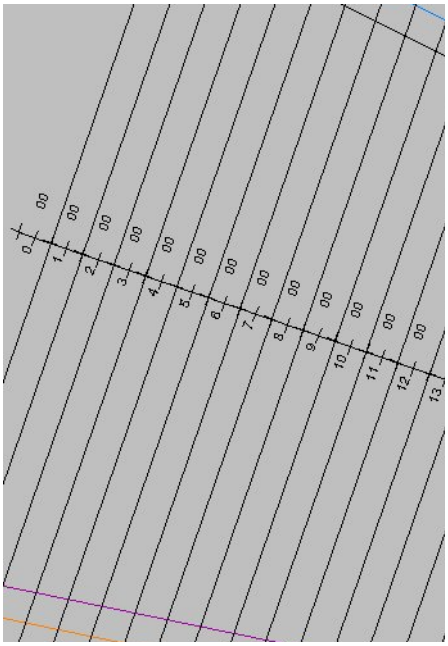
FIGURE 2-46. *Making Layer Assignments*



4. **Select the starting chainage and naming format**. This format will apply only to single-segmented straight lines. If you include multisegmented lines they will be named using consecutive numbers rather than chainage,
5. **Select your Export format**.
6. **Export your file and save it**. Click on [Export]. When the layer assignments meet the program requirements, the program will display a Save Dialog for you to name your file. The resulting file will be saved with the .LNW extension to a user-defined filename and directory.

If the center line layer is assigned, lines will be sorted by distance-down-line where the starting point is the first node of the center line found. This will establish the center line direction. Otherwise, the lines will be written as they are read from the file, even though they may be non-sequential. The program will also swap endpoints of planned lines, if necessary, to be consistent in calculating intersection distances. Lines will be named lin_x where x starts at 0.

FIGURE 2-47. *Planned Lines are numbered sequentially.*



NOTES:

- **If you are exporting planned lines only**, the planned line layer must be assigned or the program will remind you to do so and do nothing.
- **If you are exporting planned lines with Template**, all of the layers must be assigned or the program will remind you and do nothing. This option is not available when exporting from DGN files.

If there is a problem during the export procedure, the program will give an explanation and possibly give you a chance to correct it. The most common problem is a planned line which fails to intersect the toe or slope lines. The program will queue up all offenders and ask you to remove them. This only removes them from memory, the original file is NOT modified. By agreeing, you can retry the export procedure.

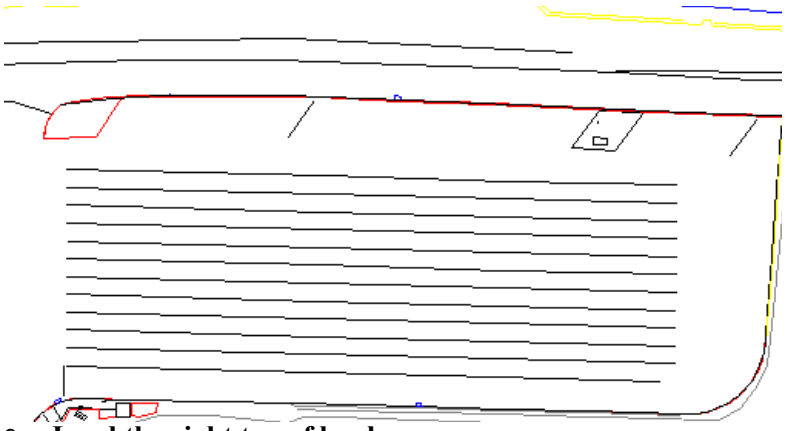
CREATING PLANNED LINES IN THE LNW GENERATOR

The LNW GENERATOR reads the horizontal survey line information from the polylines in a DXF file, appends the channel profile information from a channel template (*TPL) file and exports it to a 3-dimensional planned line file. The planned line file can be used by SURVEY to provide channel information in the profile window. SURVEY will also store the template information in the headers of the data files where it can be read by the editor and CROSS SECTIONS AND VOLUMES.

1. **Launch the program** by selecting UTILITIES-DREDGING UTILITIES-LNW GENERATOR.

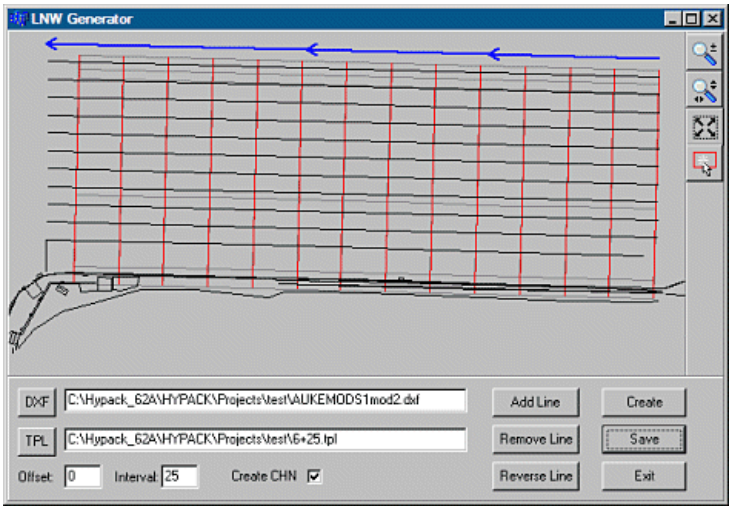
2. **Load your DXF and template files.** For each file, click its button and browse for your file. The DXF file will draw to the upper part of the screen.

FIGURE 2-48. *Input Files in the LNW Generator*



3. **Load the right top of bank.**
   a. **Click the Line Selector icon.**
   b. **Select a polyline in your DXF file that represents or runs parallel to your right top of bank;** the new line file will extend left from the selected line. The line will turn purple with arrows indicating its direction. You can verify that you have selected the right line by imagining you are standing on the line facing in the direction in which the arrows point. If the center channel would be to your left, you have done it correctly.
   If you've got a line left of the channel, select another line or reverse the line direction with [Reverse Line].
   c. **Click [Add Line].** The selected line will turn blue.
4. **Define your parameters**.
   - **Offset** defines the chainage at which you want the first cross line to be created
   - **Interval** defines the line spacing.
5. **If you want to also create a channel file, check Create CHN**.
6. **Click [Create].** Red lines will appear to show you where your lines will be created. Gray ones indicate your channel limits.

FIGURE 2-49. *Red Lines Preview the Calculated Planned Lines*



7. **Preview your lines**.
8. **If the preview is not satisfactory, modify your settings and click [Create]** again.
9. **Save your results** by clicking [Save] and naming each file you have generated.

FIGURE 2-50. *New LNW displayed with the DXF in HYPACK®*

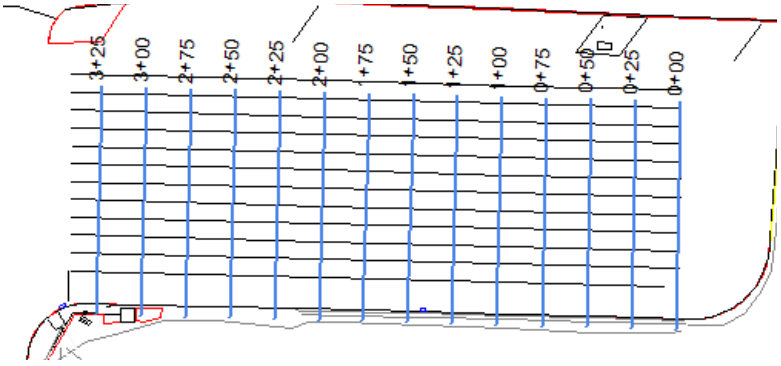


FIGURE 2-51. *New CHN displayed with the DXF in HYPACK®*

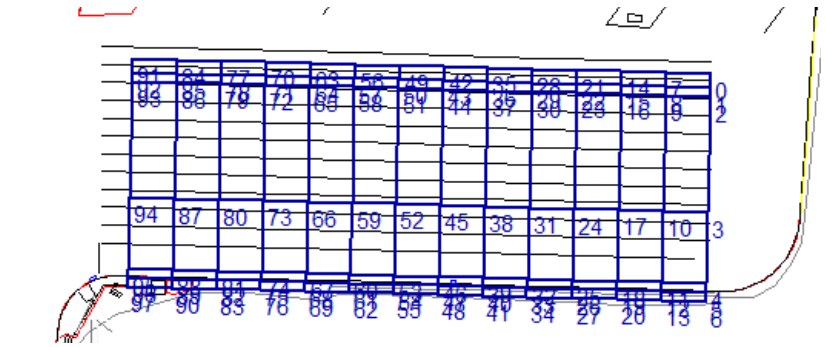
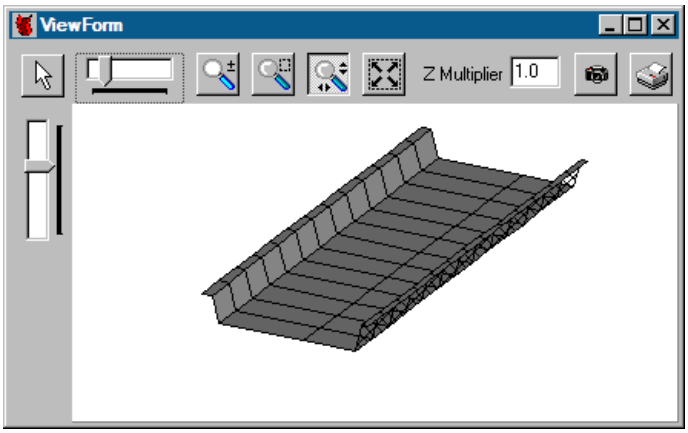


FIGURE 2-52. *New CHN in Advanced Channel Design*



NOTE INTERSECTOR is a similar program. It takes the channel information from the DXF and appends it to a 2-dimensional planned line (*.LNW). For more information see the following section.

REPORTING DISTANCES ALONG LINE

Once you have a line file loaded to HYPACK®, you can generate a listing of the distances along each survey line and their total by right-clicking on the Line File name in the Project File list and selecting *Show Lines Report*.

FIGURE 2-53. *A Sample Lines Report*

Line Distance Report: 092806.lnw
Project: Dam7000b.ini

00+00	741 Feet
01+00	747 Feet
02+00	753 Feet
03+00	765 Feet
04+00	779 Feet
05+00	789 Feet
06+00	797 Feet
07+00	816 Feet
08+00	835 Feet
Total Lines: 9	7022 Feet

BORDER FILES

Border Files (*.BRD): A user-defined listing of XY positionsthat defines an area in your project area. Border files are created in the BORDER EDITOR and saved to your project directory. They have several uses:

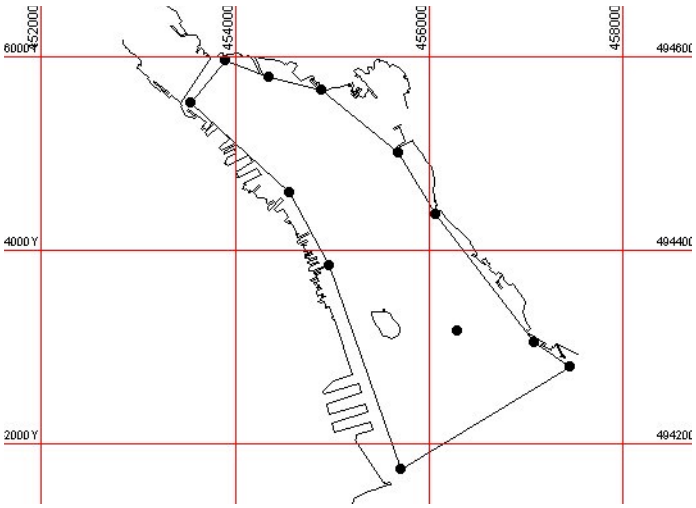
- To clip survey lines and XYZ data files to fit within a coastline or unorthometric survey area.
- They may be used in SURVEY or DREDGEPACK® to edit defined areas in a matrix.
- Define areas in the HYSWEEP® EDITOR where search and filter options will or will not be applied.
- To limit areas where volumes are calculated in TIN MODEL or CROSS SECTIONS AND VOLUMES.
- To clip TIN models.

CREATING A BORDER FILE WITH THE CURSOR METHOD

In the BORDER EDITOR, the cursor method is a quick and easy way to define your borders if you have a background file of your survey area available to you.

1. **Open the background file** in your project.
2. **Open the BORDER EDITOR** by selecting PREPARATION-EDITORS-LINE EDITOR.
3. **Specify that you are creating a new file** by selecting FILE-NEW.
4. **Click [Cursor].** The BORDER EDITOR will minimize and a BORDER EDITOR button will appear at the lower left, leaving the map visible again.
5. **Click on the map at enough locations around the perimeter of your survey area to define its shape.**
6. Once you have completed the area, **right-click inside or outside of the area** to indicate which area you wish to survey.

FIGURE 2-1. *BORDER EDITOR Preview Window*



7. **Restore the BORDER EDITOR** to the screen by clicking [Border Editor]. It will display a spreadsheet of all points you have selected.
8. **Edit your points** at this time if necessary using the right-click menu.
   - **Overtype any coordinates** you want to change.
   - **[Add]:** Inserts a waypoint at the end of the spreadsheet mid-way between the first and last points.
   - **Insert:** Adds a point mid-way between the selected point and the point *before* it.
   - **Delete:** Removes the selected point.
   - **Delete All:** Removes all waypoints in the current file.
   - **Copy:** Copies the selected coordinate pair to the Windows® clipboard.
   - **Paste:** Overwrites the selected coordiate pair with the copied coordinate pair on the clipboard.
9. **Preview your entries** by clicking [Preview]. The BORDER EDITOR will minimize and the area map will zoom in on your points.
10. **Save the file.** When you are satisfied, click FILE–SAVE AS. You will be asked to name the Border File which will be saved, with a .BRD extension, to the project directory and enabled (drawn to the screen) in your project.

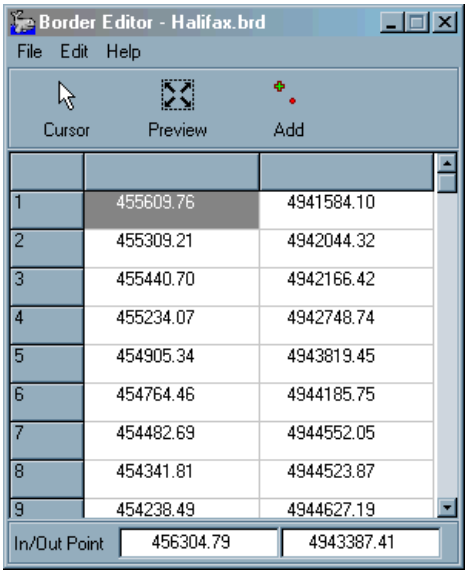
NOTE: You may need to repeat this process multiple times if more than one area must be defined.

CREATING A BORDER FILE WITH THE SPREADSHEET METHOD

This is useful if you know the coordinates of your shoreline, islands and any other areas you want to exclude from your survey area that is currently covered by your planned lines.

1. **Open the BORDER EDITOR** by selecting PREPARATION-EDITORS-BORDER EDITOR. The BORDER EDITOR will appear.
2. **Specify that you are creating a new file** by selecting FILE-NEW.
3. **Enter the coordinates for your boundary.**
   a. **Click the Add Point icon for each point needed** to define the area perimeter. Each point will be automatically filled with the coordiantes of the upper left corner of the area map.
   b. **Edit the coordinates with the waypoint position information for your border file.**. Remember that the points must form one continuous line.
   c. **Set the In/Out Point** to define which area you wish to survey. (If it is inside the area defined, you will be surveying inside the defined area).

FIGURE 2-2. *The BORDER EDITOR Window*



4. **Preview your entries** by clicking [Preview]. The BORDER EDITOR will minimize and the area map will zoom in on your points.
5. **You may edit your points as necessary** by reopening the BORDER EDITOR and making any changes using the right-click menu.

   Once a border is defined, you can select any point in the border, which will turn it red, and modify the file as follows:

   - **Overtype any coordinates** you want to change.

- **[Add]:** Inserts a waypoint at the end of the spreadsheet mid-way between the first and last points.

A right-click on the selected point accesses the following menu:

- **Insert:** Adds a point mid-way between the selected point and the point *before* it.
- **Delete:** Removes the selected point.
- **Delete All:** Removes all waypoints in the current file.
- **Copy:** Copies the selected coordinate pair to the Windows® clipboard.
- **Paste:** Overwrites the selected coordinate pair with the copied coordinate pair on the clipboard.

6. **Save your file** by clicking on FILE-SAVE, giving it a name and saving your file to your project. Your Border File will be saved with the BRD extension in your project directory and enabled (drawn to the screen) in your project.

NOTE: You may need to repeat this process multiple times if more than one area must be defined.

HARDWARE SETUP IN HYPACK®

'**Hardware**' is the term we use for the sensor devices from which HYPACK® receives data. In order for HYPACK® to work properly, we need to know what kind of instruments you have, how they are connected, how often you want to read them, how often you want to record them, etc.

Positioning devices are *always* configured in HYPACK® HARDWARE.

The remaining devices are selected and configured in the HYPACK® HARDWARE, SIDE SCAN HARDWARE or HYSWEEP® HARDWARE programs as follows:

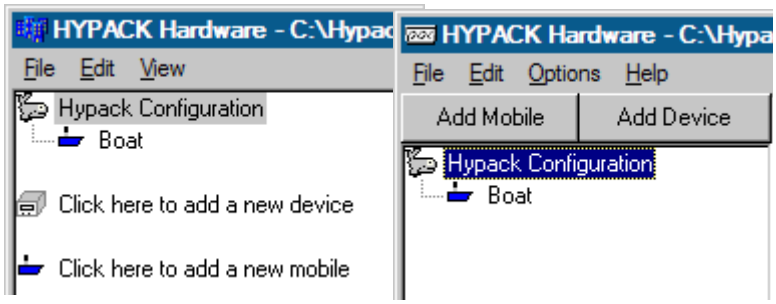
HYPACK® HARDWARE	• Devices used exclusively in single beam projects (single beam sounders) • Devices used in *both* single beam and multibeam surveys (ex. GPS, tide gauges) • Dredging tools (inclinometers, digging tool drivers)
HYSWEEP® HARDWARE	• Devices used only in multibeam or multiple transducer surveys • Side scan devices when they are used together with multibeam devices.
SIDE SCAN HARDWARE	• Side scan devices when no multibeam data is to be included in your project. The data is then collected using SIDE SCAN SURVEY.

If your equipment does not change, and you are satisfied with the communication between your equipment and the survey programs, you don't have to run HARDWARE again.

If you change survey equipment, you will have to reconfigure your hardware.

1. **Select PREPARATION- HYPACK HARDWARE** or click on the Hardware icon. The HARDWARE window will appear with any configured devices listed on the left. When there are no devices configured, it lists a "boat" with no devices.

FIGURE 2-1. New Hardware Configuration Basic Mode (left), Advanced Mode (right)



2. **Select FILE-NEW and open a configuration file**.
   - A menu of **generic configurations**, starts you with a set of drivers, and possibly multiple vessels, which you must then modify with the correct driver setups, connection settings, offsets, etc as appropriate to the devices on your vessel. Select the device in the list and change the entries in associated dialogs. The new settings will be saved to the Survey32.ini file when you exit HARDWARE.

     If you are using a hardware setup other than the Survey32.ini, save your changes by selecting FILE-SAVE AS.
   - The '**Empty Configuration'** begins with a single vessel and no devices. You will be warned that this will overwrite the current hardware configuration. If you want to save it, click [No] and save your configuration file before proceeding with this step. If you don't need it or have already saved the current configuration, click [Yes] and build a new hardware configuration from the beginning.
3. **Select your display mode**. HARDWARE offers two display modes in the Options menu:
   - **Basic Display Mode** does not display drivers under the vessel to which they are assigned as this may be a preference for some users. It provides"hot spots" instead of "buttons" with which to add devices and mobiles.
   - **Advanced Display Mode** displays the drivers under the vessel to which it is assigned and provides buttons to add a mobile or a device.
4. **Select your input mode**. HARDWARE offers two modes in the Options menu:
   - **Basic Input Mode** provides the options for a simple hardware configuration—information that HYPACK® needs to know about any device in your setup. It allows you to set data to be recorded, offsets and connection information and to associate the device with its vessel. If the driver requires unique driver options, click [Setup] to access the Driver Setup. All other options are set to default settings.

- **Advanced Input Mode** displays an additional tab with options for more complex configurations and for overriding certain defaults.

5. **For each device in your survey**:
   a. **Select its device driver**.
   b. **Name your device**.
   c. **In the Device dialog**, set the type of data to be obtained from the device, the offset and connection information.
   d. **Click [Setup] and specify any setup information** specific to that device driver. Each setup is different according to the needs of the device driver. Some drivers do not require any setup information.
6. **Set your Vessel settings.** Each vessel in your configuration has an associated Mobile dialog which is displayed when you select the vessel's name in your device list. This is where you set the tracking point and, if applicable, the function and default dimensions. The Information/Source spreadsheet displays the data types you are set to receive and the driver from which HYPACK® will read them for the currently selected vessel.
   - **If you are in Basic mode**, it is for display purposes only.
   - **If you are in Advanced Mode**, you can modify these settings if you choose. This lends increases flexibility for more complex systems.
7. **Save your configuration.** If you use more than one configuration, save your hardware setup by selecting FILE-SAVE AS and naming the configuration. It will be saved with an .INI extension to the project directory and can be recalled by selecting FILE-OPEN. This is helpful if you use more than one hardware setup. You only have to input each set of information once, save it, then reopen the configuration when you need it again.

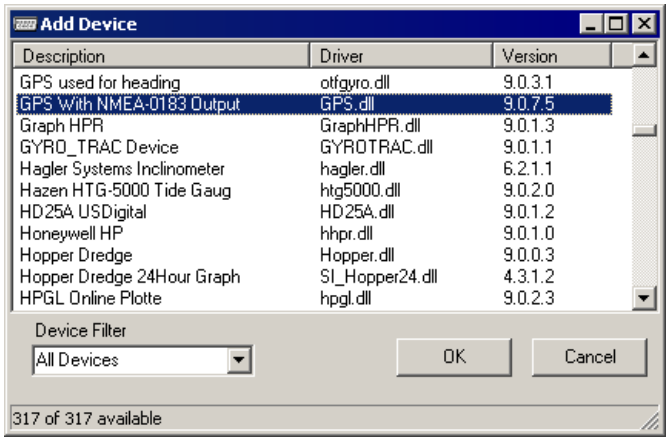
   If you check the 'Automatically Save on Exit Hardware' option, your current settings will automatically be saved to the survey32.ini in your project directory when you close the program. The same configuration will be reloaded when you re-open HARDWARE. If this is not checked, you will be asked whether to save the configuration when you exit HARDWARE.

SPECIFYING DEVICES IN HYPACK® HARDWARE

1. **Click [Add Device] and** the device driver library will appear.
2. **Select the device driver** (*DLL) for one of your devices. To help you find what you need, the list can be sorted and filtered as follows:
   - **You can sort the list by driver name or description** with a click of the corresponding column heading.

- **You can list the drivers by recording capability.** Just select the type of data you want to record in the Device Filter list, and the library will display only those drivers with the selected capability. This reduces the number of drivers as you search for the one corresponding to your device.

FIGURE 2-2. *Device Driver Library*



NOTE Only the most commonly used drivers will initially be included in your list. If your configuration requires custom or dredging drivers, you will find them in subdirectories contained in the Devices directory. Exit from HARDWARE, use Windows® Explorer to move them into the Devices directory. When you return to HARDWARE, they will appear in the Device Library.

Beware!

BEWARE! **If you are using HYPACK® version 6.2 or later, do not attempt to use drivers from earlier versions of HYPACK®.** They are incompatible**.**

3. **Click [OK].** The device will be added in the device list.

To change the name select the driver in the configuration list then select EDIT-RENAME and enter your new device name.

To display the device number with the device name, select OPTIONS-DISPLAY and check DEVICE ID. To remove this display, repeat the menu selections.

BASIC DEVICE SETUP IN HYPACK® HARDWARE

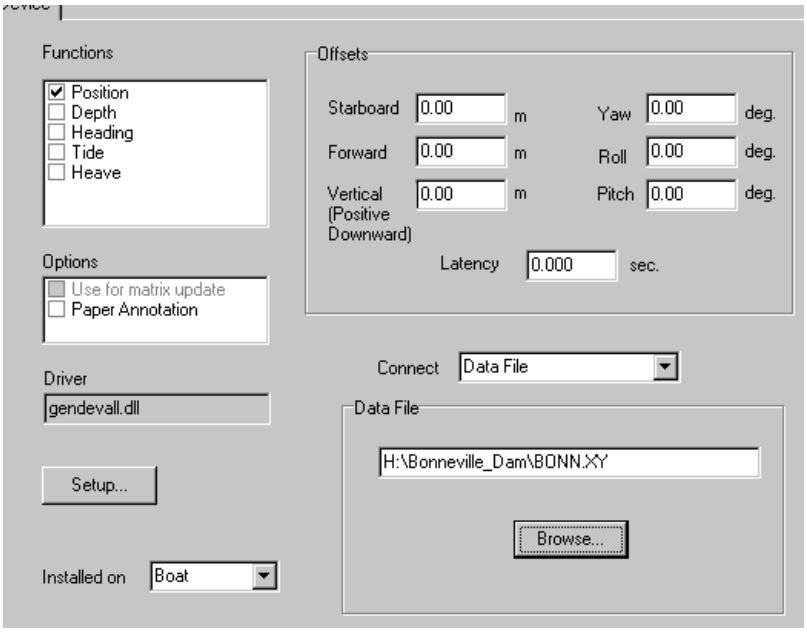
All of this basic information, required for all devices in your configuration, is found in the Device tab displayed when you select a device in the configuration list at the left.

These settings provide HYPACK® instruction about:

- What type of data the driver will record and output

- The device position on the vessel.
- How the device is communicating with the computer.

FIGURE 2-3. *Device Setup dialog*



SPECIFYING DATA INPUT AND OUTPUT IN HYPACK® HARDWARE

Input/Output settings concern which driver capabilities you want to use to record and export data. They include:

- **Driver Functions** indicates what type of data you expect the device to record.
- **Options** settings allow you to optionally record or annotate (or both) the Raw and Quality measurements from certain types of survey equipment. HYPACK® records all of the final information for all sensors. It always records the computed position for DGPS updates, the raw depth information received from echosounders, the gyro heading from gyros, etc.
- **Setup**: Each device usually specifies information that is particular to a single device. Some devices will not require any special "setup", and the [Setup] button will be disabled or will just return information about that device. Other device drivers require detailed information that can only be entered through the Driver Setup dialog.
- **Installed on**: Specify the vessel on which the device resides. This option defaults to ‘boat’. If your configuration defines more than one vessel, you must tell HARDWARE which devices are on each vessel.

Device Functions in HYPACK® Hardware

The Functions list in the Device dialog shows types of data the selected driver can collect. Check the data types that you want to collect with this driver. For example, a GPS unit, may be used to get the position, calculate speed and heading. With RTK capability, the GPS or Kinematic driver can also calculate tide information. This just takes a little common sense.

- **Position** tells the driver to accept the designated position messages and convert them to X-Y coordinates, using the datum transformation and projection parameters as given in the GEODETIC PARAMETERS program.
- **Depth** saves depths data.
- **Heading** tells the SURVEY program to store heading data.

Beware!

BEWARE!If you have a gyro, the SURVEY program will use that as the primary orientation information. In this case, *you should **not** also select for GPS heading* as this would cause SURVEY to switch between gyro and GPS orientation as each device updates, and your vessel will 'twitch' on screen.

- **Speed** tells the SURVEY program to use the speed information from the VTG message for the vessel speed. The GPS speed is much smoother and more accurate than the speed the SURVEY program will calculate.

We recommend that you use the speed from your GPS antenna.

- **Tide** is available for tide gauge drivers and for the GPS or Kinematic Device Driver which can perform real time water level determination. If you check this box, the program will store water level corrections from a tide gauge or, used with the GPS or Kinematic driver, it will create water level corrections at each GPS position update, based on the separation between the ellipsoid height and chart datum and the separation between the GPS antenna and the echosounder transducer.
- **Heave** records heave, pitch and roll data.

Device Options in HYPACK® Hardware

The **Options** settings allow you to optionally record or annotate (or both) the Raw and Quality measurements from certain types of survey equipment. HYPACK® records all of the final information for all sensors. It always records the computed position for GPS updates, the raw depth information received from echosounders, the gyro heading from gyros, etc.

- **Use for Matrix Update** will only be available for echosounders and magnetometers. If this option is checked, data from this device will be used to fill the matrix file in Survey. If you have more than one depth device in your setup, check this box for only one of them.
- The **Paper Annotation** selection is only applicable to echosounders with annotation capability. Checking this will enable echosounders with this capability to mark significant events during the survey.
- **Record Lat/Lon data** in earlier HYPACK® versions was "Record Raw Data". When this box is checked for a GPS device, the program

will also record the WGS-84 latitude/longitude/ellipsoid height along with the position record. This is desirable because it enables you to re-compute positions in post-processing should you enter bad datum transformation parameters during the data collection.

Unless there are overriding factors, we strongly suggest that you always Record Lat/Lon. data.

- **Record Quality Data** allows you to record quality information obtained from different devices.
- **Record Raw Messages** enables you to record the data string, as it is read from the device, into your raw files.

NOTE This option is required to record positioning data necessary to recalculate RTK tides in post-processing if necessary. If you are working with RTK tides, and collect data with erroneous configuration settings, this data will allow you to recover in post-processing.

- **Generate Output Messages:** The driver constructs and sends messages out the designated port.
  The NMEA driver is one such driver. In this case, it tells the NMEA driver to output NMEA messages. It can generate NMEA style messages, even if your positioning system is a non-NMEA device (e.g. range-azimuth or range-range system). You specify which messages to send in the Driver Setup dialog.
- **Record Device Specific Messages** records data strings as described in the driver. It allows us to customize output strings for our users where necessary.

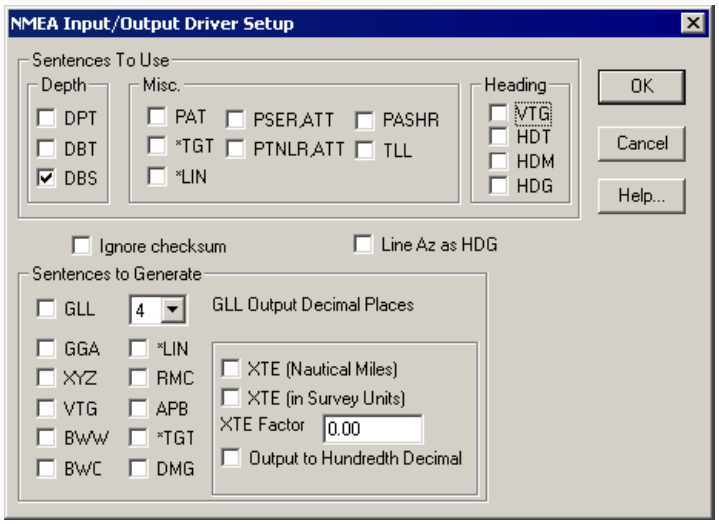
DRIVER SETUP IN HYPACK® HARDWARE

Click on [Setup] in the Device Setup dialog, to display the Driver Setup window. Each device usually specifies information that is particular to a single device. Some devices will not require any special “setup”, and the [Setup] button will be disabled or will just return information about that device. Other device drivers require detailed information that can only be accessed from the Driver Setup dialog.

The Driver Setup dialog for the NMEA-0183 driver is one of the more complex setup windows and is used to illustrate the amount of detail that can be specified for certain devices.

Once you have finished specifying the information required about the driver in its Driver Setup dialog, click [OK] to return to the Device Setup window.

FIGURE 2-4. *NMEA Driver Setup Window in* ***HYPACK® HARDWARE***



CONNECTION INFORMATION IN HYPACK® HARDWARE

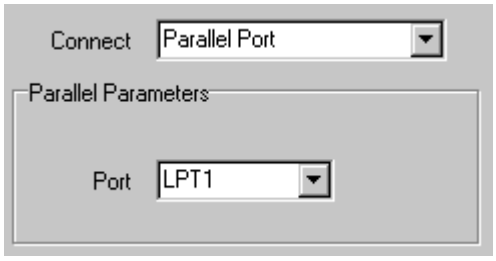
More Information

- "Serial Interfacing" on page 10-59
- "Testing Serial Communication in HYPACK® HARDWARE" on page 2-129

PARALLEL PORT CONNECTIONS

The Parallel port number is the only setting required for parallel connections.

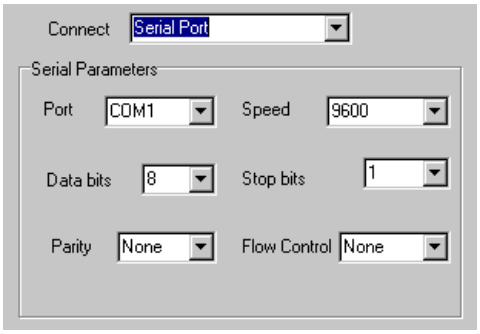
FIGURE 2-5. *Connect – Parallel Port Window*



CONNECTING TO A SERIAL PORT

The Serial connections (Parity, Flow Control, baud, Data Bits, Stop Bits and Flow Control) must be set to match your equipment or SURVEY will not read the device data.

FIGURE 2-6. Serial Connect Dialog



The **COM test** shows status of serial communication ports. Ports shown as available are those that SURVEY and HYSWEEP® SURVEY can open for reading, although this can be misleading. Modems, for example, show up as available but are seldom used for device connection. Ports shown as not available are truly that.

Ports connected to working HYSWEEP® devices show the latest messages. ASCII devices send easy-to-read messages. Binary devices show garbled messages even when the data is good.

Computers used for data collection usually require more communication ports (COM1, COM2,...) than are available on a standard PC. Expansion cards are available from HYPACK, Inc. and many other vendors. The only requirement is that the vendor supplies a working driver compatible with your Windows® operating system with the card.

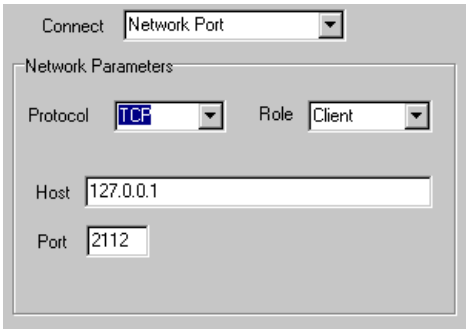
NETWORK CONNECTIONS

Network devices are becoming more common. Echosounders with network connections are advantageous in that full scan information can be recorded instead of only the depths.

To choose to receive data over a network:

Select the Network Connect type and define the network settings in the Network Parameters.

FIGURE 2-7. HYPACK® HARDWARE Network Connect Dialog



Protocol: Choose between TCPIP, which passes data between two specific computers or UDP, which broadcasts to all computers on the local network

Role: *Only valid for TCPIP protocol*, it depends the configuration in the echosounder. You can check your sounder's user manual for that information but, the majority of the time, the sounder will be the Server so you should configure HYPACK® to be the Client.

Host: This is the IP address of your sounder. Your sounder should be set to read the IP address of your survey computer.

Port: The port number is set for each device. It is the port from which HYPACK® is to read data.

- Odom devices use 1601.
- Reson devices use 1998.

Write Port is only required for the UDP protocol. It is the port at which HYPACK® should respond to this device.

Analog Devices

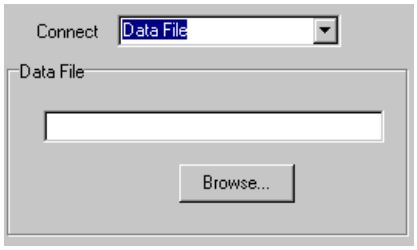
Analog devices are frequently found on dredges to measure rotation. They interface with your survey computer through an Analog to Digital (A/D) card specific for the kind of input.

- 4-20mA
- 0-5VDC
- 0-10VDC
- -5 to +5VDC

Input from a File

One of the more useful features in HARDWARE is the ability to specify a Data File as input. This allows the program to read a file of recorded data to test if it can properly understand the data coming from a device. Many times, when you are having a problem with a device in the field, we will ask you to log some of the output from the device to a file and upload it to us. We can then replay the information using the 'Data File' setting to see what is going on.

FIGURE 2-8. *Connect-Data Window*



Testing Serial Communication in HYPACK® HARDWARE

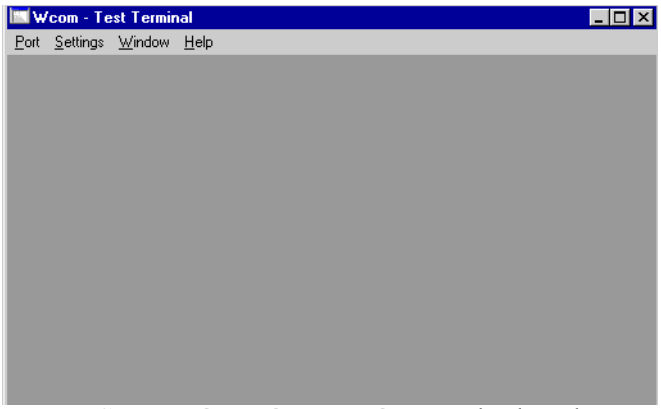
1. **Make sure the equipment is turned on** and actually sending information. This can be confirmed by attaching a serial LED line tester to the end of your cable. The Receive Data light should be flashing (changing state from red to green) at each measurement transmission. If there are no lights flashing, your equipment is not transmitting or your cable is grossly wrong. A serial LED line tester

is a great piece of equipment that can be picked up inexpensively at an electronics store.

2. If you have verified the equipment is transmitting, **try to display or record the data in the WCOM32 program.** HYPACK, Inc. has included a shareware program (courtesy of Comtrol Corp., the manufacturer of Rocketport serial cards) in your HYPACK® install to make this recording process really easy. Here's how it works.

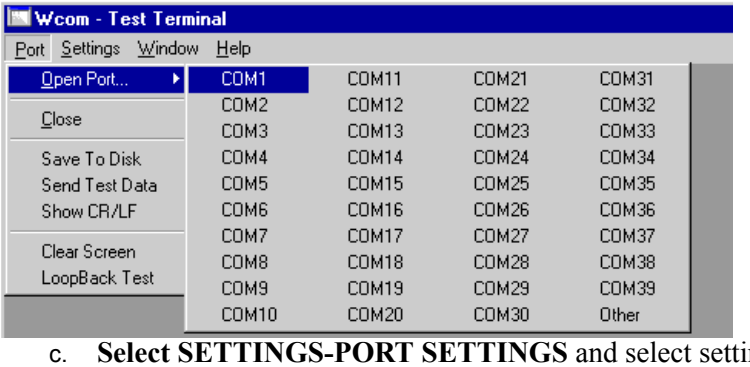
   a. **Launch the Wcom32 program** by selecting OPTIONS-WCOM32 in the HARDWARE window. The WCom32 dialog will appear.

FIGURE 2-9. *Connect-Data Window*



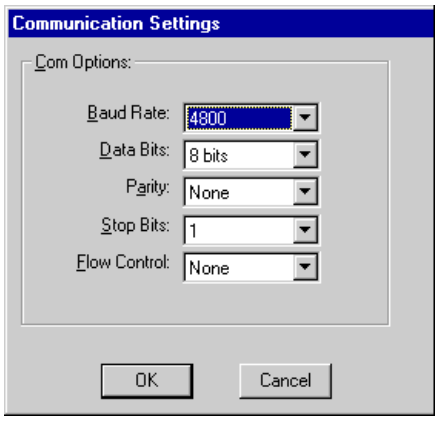
   b. **Select PORT-OPEN PORT** and select the port from which you want to capture data.

FIGURE 2-10. *Selecting the Port*



   c. **Select SETTINGS-PORT SETTINGS** and select settings that match those of your device.

FIGURE 2-11. Port Settings



d. **Repeat the steps 3 and 4 for each device** from which you would like to record data.

e. **Select PORT-SAVE TO DISK** and wait about a minute. The data is now recording to files on your hard drive.

f. **Select PORT-SAVE TO DISK** again (deselecting this option) to end the recording process.

g. **Rename your saved data files by device name**. Use Windows® Explorer to go to the \Hypack\Support\Com directory. The files that you have just recorded are named KOMx.txt where x is the port number from which the data was recorded. You can see that a data file named for the port rather than the device would soon be mixed up with all of the others that are named in the same way. This will avoid that problem.

NOTE This is also the procedure to use if you have questions or problems regarding your data and or Technical Support asks you to send us some sample data.

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3. If you are successful in reading the messages in the WCOM32 program, **test each device in the HARDWARE program**. This checks that you are using the correct device driver and whether the communication settings have been properly set.

   a. **Start the HARDWARE program**.

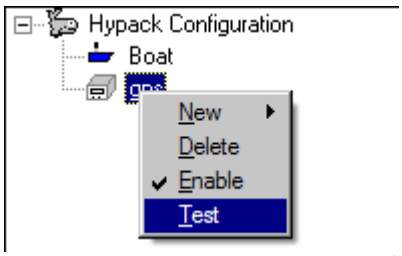
   b. **Test your first device by right-clicking on the device in the configuration list and selecting "Test",** The HARDWARE program will launch the TEST program with a sample device window for that device.

   You can suspend the display updates to allow you to view it more easily by selecting TEST-PAUSE ALL. Repeat the same selection to resume scrolling.

   Terminate the test by selecting TEST-STOP ALL.
   If you are unsuccessful at this point, you probably have the

wrong device driver specified in the Library entry. Contact HYPACK, Inc., Inc. and ask for Tech Support.

FIGURE 2-12. *Launching the Interface Test for all equipment from the HARDWARE Program*



c. **Repeat the test process for each device.** When all test correctly individually, go on to the next step.

NOTE Once the Test program is open, you can test remaining devices from within the Test program by selecting TEST-*DeviceName*.

d. **Test all of the survey devices at once.** This determines if there are hardware conflicts between serial ports. In the TEST program, select TEST-TEST ALL. A device window will appear for each device.

If every device is being properly interfaced, you are ready to enter the SURVEY program.

If all of your devices work when testing them individually, but *do not* work when testing them together, you have a problem with your serial communication hardware. Contact Technical Support at HYPACK, Inc., Inc. for assistance.

OFFSETS AND LATENCY IN HYPACK® HARDWARE

The **vessel origin** is the reference by which you position your devices and tracking point on your vessel. Each sensor is referenced to the origin based on the distance in survey units it is starboard (X-direction), forward (Y-direction) and vertically (Z-direction). Vertical offsets are measured from the static water line, and are always *positive downward*.

Beware!

BEWARE! With the 2006 release of HYPACK® *the convention for the vertical measurements has changed*. The value is *always positive downward.* If you open a project that pre-dates this change, check your vertical offsets--particularly your GPS antenna height--to be sure they conform to this standard.

Assign the device to the towfish on the Device tab and use the towcable driver (also assigned to the towfish) to calculate the towfish position relative to the boat.

The best position for the boat origin varies depending on what sensors are included in your configuration. The following table provides our general recommendations for the position of the origin.

TABLE 2-1. *Recommended Vessel Origin Placements*

Vessel Type	Recommended Origin Location
With MRU:Single or Multibeam	At the MRU location
Single Beam without MRU	At the Sounder location (XY).
Vessel with sensors other than a sounder and no MRU	Vessel Center of Mass
Cutter Suction and Excavator Dredges	Trunnion point (XY).
Towed Devices	Attachment point of the cable to the towfish

MEASURING OFFSETS IN HYPACK® HARDWARE

Positional offsets are always expressed in survey units relative to the boat origin. The values should be positive as you measure forward, starboard and downward from the vessel origin.

NOTE Mobiles and Dredge Hopper Arms are exceptions to this rule.

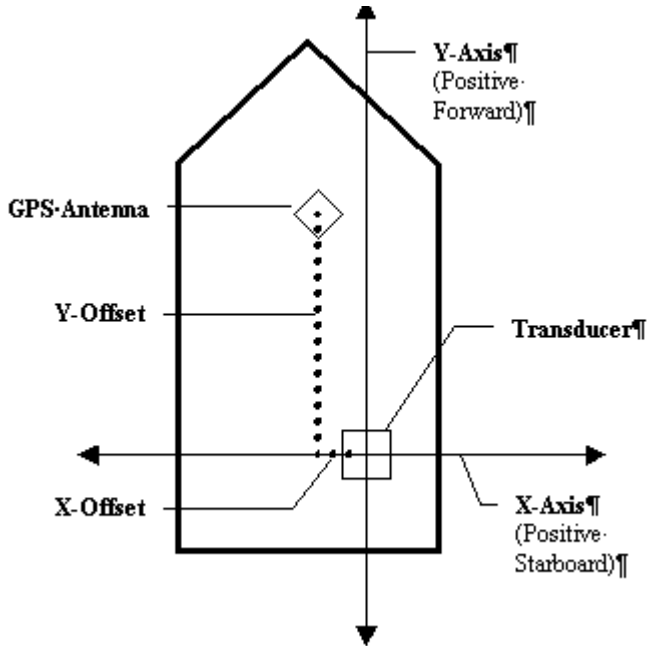
Vertical offsets are measured from the static water line. The measurements are *always positive in the downward* direction. Enter the antenna height above the water line as a *negative* value. The distance from the waterline to the transducer head will be positive.

Beware!

BEWARE! This convention has changed from version HYPACK® MAX 4.3A Gold. Offsets in projects that were created in 4.3A Gold or earlier should be modified to reflect this change.

The following figure shows a survey boat that has a GPS antenna and an echosounder transducer.

FIGURE 2-13. Sample Single Beam Boat



The boat origin has been positioned directly over the echosounder transducer and at the level of the static water line.

The GPS antenna is positioned based on the starboard and forward offsets from this location. Since the GPS antenna is port and forward of the boat origin, it would have a negative starboard offset and a positive forward offset.

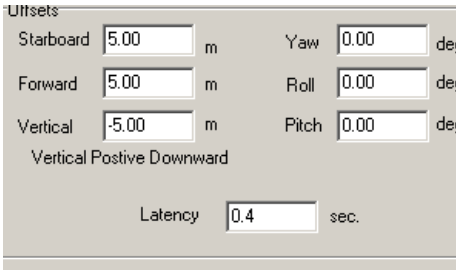
The **tracking point,** used by SURVEY to position your vessel in the world, is positioned over the transducer. We do this to assist the helmsman in keeping the transducer head over the survey line and to base all logging calculations such as start and end line, alarms, etc on the transducer position.

More Information

- "Multiple Mobiles" on page 2-231

SPECIFYING OFFSETS AND LATENCY IN HYPACK® HARDWARE

FIGURE 2-14. Offsets Dialog



Latency:

The **Latency Time** is the time delay in seconds from when a piece of survey equipment makes a measurement to when it outputs it to the survey computer. This allows the SURVEY program to correctly time-tag information from each piece of equipment. Values for single beam and multiple transducer systems can be determined in the Single Beam Latency or the multibeam Patch Test programs.

Location Measurements:

Location measurements are the distances measured starboard, forward and vertically from your boat origin and your device.

- The **Starboard** and **Forward** offsets are always expressed in survey units. Use positive numbers for positions forward and starboard of the origin; use negative numbers for transducers aft and port of the origin.

  Remember that multibeam boats require some type of Motion Reference Unit (MRU) to compensate for vessel heave, pitch and roll during survey.

For best results, the MRU should be mounted at the pivot point for roll and pitch rotations and the multibeam transducer should be mounted as close as possible to the MRU. This way, the heave measured by the MRU is the same as the heave experienced by the transducer. Measure the horizontal distances from the navigation origin using the sign convention used with transducer measurements.

- **Height** should be entered as the height above or below the static waterline of the vessel. This is the waterline location when the boat is stationary. Of course, this point changes under various conditions (weight of passengers, fuel and cargo), but you have to start somewhere. You should enter *positive* values, measured in survey units, for equipment *below* the surface,.

Rotation Measurements:

The rotation angles (yaw, pitch and roll) are critical to the success of multibeam surveys. These measurements are difficult to make with high accuracy. Do the best you can then do a Patch Test to find the real rotation or use 0 for all angles and let the Patch Test do the work.

- The **Yaw** offset is an orientation offset that is added to ship's orientation. It is intended for use with multiple transducer systems that are not oriented perpendicular to the ship's longitudinal axis. Yaw corrections are normally determined in the Patch Test program and are entered as decimal degrees in this dialog. Yaw offset can also be entered when gyros provide magnetic orientation to correct for magnetic variation.

  Transducer and MRU Yaw: The transducer and MRU should be aligned with the keel. If they are, use 0 for yaw (or 180 for reverse mounting of the transducer). If either is slightly misaligned, use a positive angle when it is rotated clockwise.

  Gyro Yaw: The Gyro should be aligned with the keel. If it is, use 0 for gyro yaw. If the gyro is slightly misaligned, use a positive angle when the gyro is pointing to the port side, negative when pointing

starboard. Gyro yaw is also used to correct for variation of magnetic north from true north. To correct, add the variation to the mounting offset. For example, if the gyro has a mounting offset of –1.5 degrees and magnetic north is + 4 degrees from true north.
Gyro yaw offset = mounting offset + magnetic variation
=-1.5 + 4
=2.5 degrees

- The **Pitch** offset is normally only entered for multibeam sensors which are not oriented directly below the vessel. It allows you to enter mounting angles for forward- or rear-looking sonars. These angles are also determined in the Patch Test are entered in decimal degrees. The transducer and MRU should be aligned vertically. If they are, use 0 for pitch. If either is slightly misaligned, use a positive angle when it is pointing forward.

NOTE The MRU is usually calibrated during installation and adjustments made in the device itself. The Patch Test calculates a combined adjustment value which will be applied to the transducer.

- The **Roll** offset is normally only entered for multibeam sensors which are not oriented directly below the vessel. It allows you to enter mounting angles for forward- or rear-looking sonars. These angles are also determined in the Patch Test are entered in decimal degrees. The reference roll angle is 0 for vertical mounting of the transducer and MRU. Use a positive angle when the transducer is rotated to the port side, negative when rotated to starboard.

Multiple Transducer Offsets

There are some multiple transducer systems that are still available in HYPACK SURVEY. If this is the case, enter an offset for each transducer in the driver setup.

More Information

- "Multiple Mobiles" on page 2-231

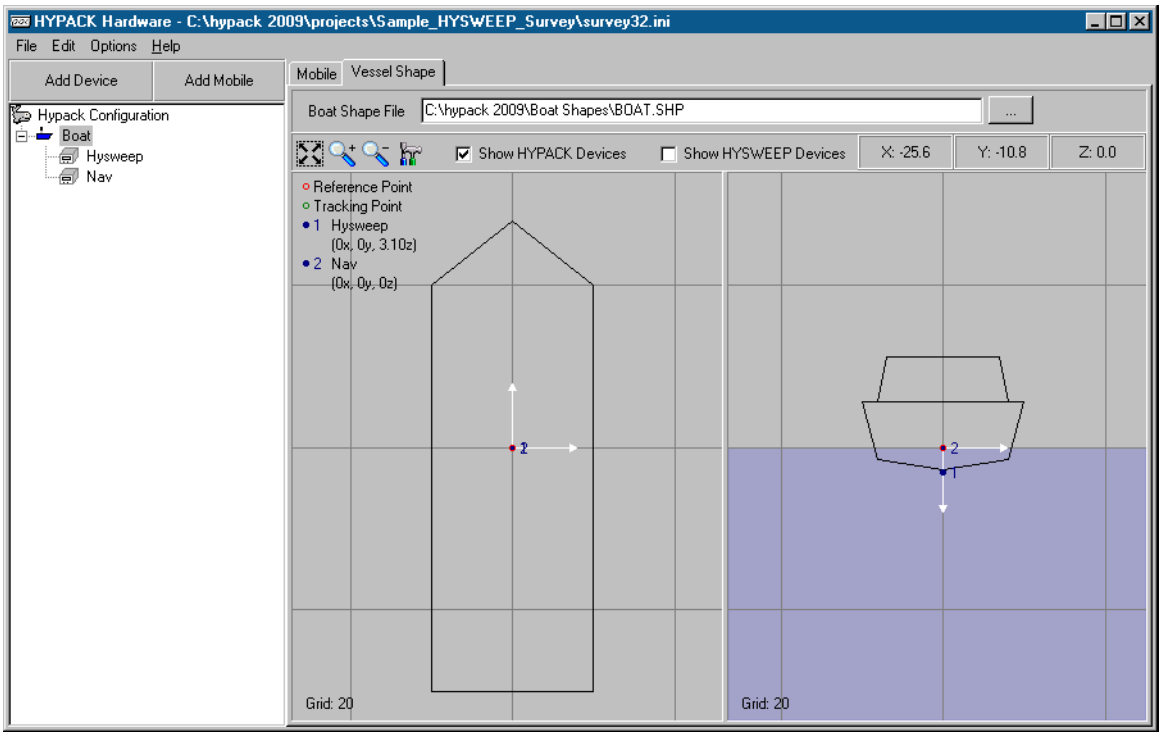
VIEWING DEVICE POSITIONS RELATIVE TO YOUR BOAT SHAPE

When you select your vessel in the configuration, the Mobile and Vessel Shape tabs are displayed.

In the Vessel Shape tab, you may select a boat shape file (*.SHP) and view an overhead display of the shape and a rear view of a generic vessel, overlaid with the device positions.

The devices in your configuration are listed in the order they are entered in the configuration and their device numbers are positioned in the boat shape according to their offset settings.

FIGURE 2-15. Vessel Shape Tab



To select your boat shape, click the [...] for the 'Boat Shape File' option and select the SHP file that matches your vessel.

The Vessel Tab includes a toolbar with some basic tools with which you can adjust the display.

- **Basic zoom tools** adjust the scale of the vessel display.
- **Grid Options** affect the display other than the boat shape and devices. Access the dialog with the Control Panel icon.

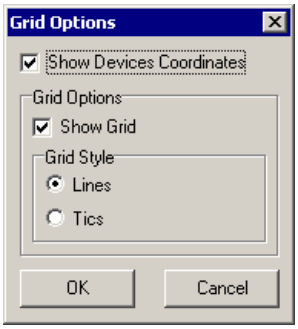


FIGURE 2-16. Control Panel

Show Device Coordinates displays the offsets for each device.

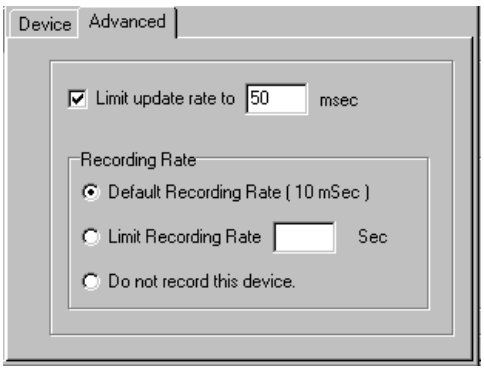
Show Grid draws grid lines or tics, according to the **Grid Style** selection, in the display to provide information about the scale of the vessel.

- **Show HYPACK® Devices** and **Show HYSWEEP®Devices:** Choose whether to display of the devices configured in HYPACK® HARDWARE or HYSWEEP® HARDWARE respectively.
- **X, Y and Z displays** of the current cursor position relative to the vessel origin in the displays.

ADVANCED DEVICE SETUP IN HYPACK® HARDWARE

Options in the Advanced tab are less common or unnecessary by typical hardware configurations.

FIGURE 2-17. *Advanced Tab*



Limit Update Rate To: In HYPACK® version 4.3A and earlier, this option was known as the "Update Frequency". It is the time interval (in milliseconds) that the SURVEY program will request information from the device. The default value is 10, but you can modify the amount of information passed between the device driver to the SURVEY program through this setting.

A millisecond is 1/1000th of a second. If your echosounder is updating 20 times per second and you specify an update frequency of 100 milliseconds, the device driver will only pass the last depth received to the SURVEY program 10 times per second, based on the update frequency setting.

Drivers that have "Generate Output Messages" capability default to 100 msec.. A limit of 500 msec. will be appropriate for the purposes served by most of these drivers.

All devices in HYPACK® operate on a "Last Only" basis. This means if a new piece of information arrives at the device driver before it has delivered the last update, it deletes the earlier information and holds only the last measurements. If you want to get every bit of information received from a particular device, make sure the update frequency is quicker than the update rate of the equipment.

Recording Rate: This is equivalent to the Record Basis in HYPACK® Max 4.3A Gold. It is the rate (in seconds) at which SURVEY records values for the device when 'On-Line'. The default rate is 10 msec…You may choose not to record device data if you need the information while out in the water, but not when you're back in the office.

In most cases, we highly recommend you do not limit the recording rate. This will give you plenty of data from which to select your final

soundings in post-processing. Remember, it is better to come home with too much data than with too little.

The exception would be for certain drivers in dredging configurations.

- For drivers that output information you need only during data collection. For example, the Vulcan driver expands the area of the matrix that will be painted by any one sounding. You need an update rate fast enough to assure accurate painting of the matrix, but if you also stored the soundings in raw files, you would rapidly accumulate data that is excessive for the slow speed of a dredge.
- Barge Position changes so slowly, multiple updates/second are unnecessary.

Device Initialization Script: This option is used to send user-supplied configuration information to certain echosounders. The information is sent at the start of SURVEY to restore the device to exact settings.

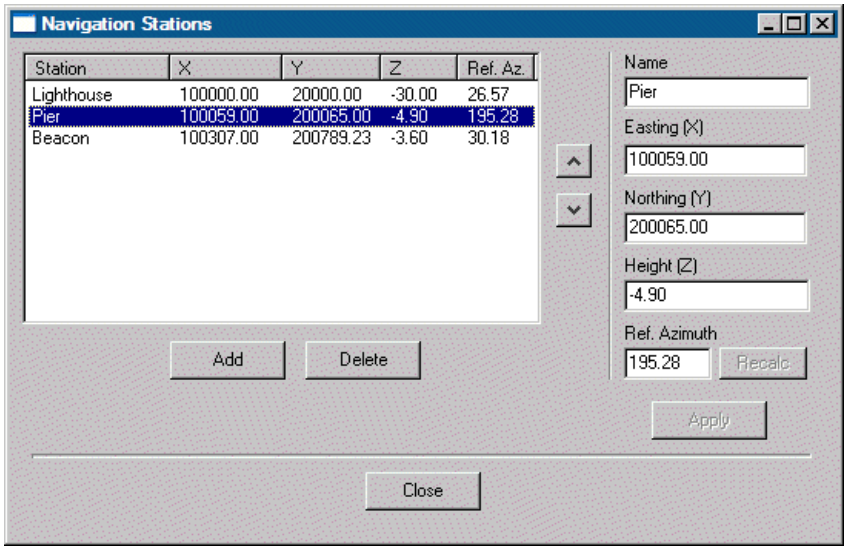
Output Info For is for very unusual cases where drivers are generating information for one vessel while assigned to another. Scenarios where this would be used are complex. If you think you need this, contact HYPACK® Technical Support for guidance.

Position Relative To: This option allows you to create "chains" of mobiles, each one having a known position relative to the previous one. An excavator.is a good example of this. An excavator is a good example of this. The boom position relative to the cab is calculated using data from an angle sensor, its measured length. Once that is known, we can calculate the position of the stick relative to the boom, then the bucket relative to the boom.

STATION INFORMATION IN HYPACK® HARDWARE

Station Information is needed for Range-Range and Range-Azimuth type of positioning systems. It is not required for any other type of systems including GPS. Click **[Nav Stations]** and the Navigation Stations dialog will appear.

FIGURE 2-18. List of Navigation Stations



1. **Click on [Add].** A "New Station" will appear in the Stations list.
2. **Enter a name and the X-Y-Z coordinate information for your station** in the fields to the right.
3. **If you have a range-azimuth system, enter a reference azimuth in decimal degrees**. This value can calculated for you when you have entered the second station coordinates. Select Station 1 and click [Recalc] to calculate the Reference Azimuth from north to Station 2.
4. Click **[Apply]** and your specified station will be added to the list.

You can enter multiple stations for range-range systems by repeating this process.

RANGE-AZIMUTH SYSTEMS

Range-Azimuth systems, require the coordinate information for the shore-based station site. This includes the X-Y-Z coordinate information. These coordinates must be on the ellipsoid and projection that has been selected in your geodetic parameters.

For a typical range-azimuth station, the Number is denoted by the order it is placed in the Stations List for range-azimuth systems.

The **Reference Azimuth** is critical to the computation of correct positions. The SURVEY program adds the Reference Azimuth to the horizontal angle received from the shore-based station. *It is always entered in decimal degrees.*

There are two different ways you can operate with range-azimuth systems.

- **The operator of the shore-based station "zeros" the unit on the backsight and sets the unit to output "0"**. The reference azimuth at

the location of the shore-based station from north to the backsight station. This is always entered in decimal degrees.

- **The operator of the shore-based station turns to the backsight and sets the shore-based station to read the actual azimuth from grid north to the backsight target**. The shore-based station will then be outputting "true" azimuths to the survey program and there is no need to add a reference azimuth value. In this case, you will enter "0" for the Reference Azimuth.

RANGE-RANGE SYSTEMS

Range-Range systems, require from two to four stations. The HYPACK SURVEY program uses the "Variation of Coordinates" technique to calculate the "best fit" position during surveys where more than two shore-based stations are available. This is a universally accepted technique that is used throughout the hydrographic industry. It determines the best-fit position as the location where the sum of the square of the residual errors for each range (calculated minus observed distance) is a minimum.

To accomplish this computation, the algorithm needs a starting position. This value is the "Approximate Position" which is entered in the SETUP window for range-range systems. For a two-range system, the approximate position only needs to be on the appropriate side of the base line. For three- or four-range systems, the approximate position needs to be somewhere in the vicinity of the survey vessel.

In the Navigation Stations window, the "Number" for each station corresponds to the order in which the navigation station reports the range information. The SURVEY program needs to know the exact order in which the distance is being delivered to the computer.. If the SURVEY program gives the error "Non-Convergence", it is usually because the stations have not been entered in the correct sequence.

The Reference Azimuth entry has no meaning for range-range systems and should be set to "0" for each station.

VESSEL SETTINGS IN HYPACK® HARDWARE

Once all of your devices have been entered in HARDWARE, you must define your vessel settings.

A **Vessel** in HYPACK® is any independently mobile object. 'Vessel' most commonly means some sort of boat, but in HYPACK®, it may be a lot of other things--a towfish, an ROV, a digging tool on a dredge, etc. If HYPACK® needs to have a position for it, it's a vessel, also known as a **mobile**. For each mobile, HYPACK SURVEY will display a symbol or shape at its current position.

HYPACK HARDWARE always has the default ‘boat’ mobile. One ‘boat’ is all that is necessary for a simple survey. For configurations requiring multiple mobiles, you may insert additional mobiles by clicking [Add Mobile].

ASSIGNING THE TRACKING POINT

In addition to the sensors, your hardware configuration must include a tracking point..

The **tracking point** is the position used by the SURVEY program to position the vessel in the world. It is used to provide left/right guidance, make automatic “start line” and “end line” decisions, and calculate horizontal distances between the vessel and features in your survey area. It is also the location at which Quickmark targets will be marked. The tracking point is configured by entering horizontal offset relative to the boat origin in the Mobile tab

The following table lists recommended Tracking Point positions. A single beam survey vessel would place the tracking point over the transducer because all of the tracking point functions should be relative to the transducer. If you are also running a multibeam, you should choose the transducer most important to you to guide down the survey line.

TABLE 2-2. *Typical Tracking Point*

Vessel Type	Typical Tracking Point Location
Single Beam	Single Beam Transducer
Vessel with sensors other than a sounder	Choose the location most important to you: • Most important sensor • GPS antenna • Center of mass
Cutter Suction and Excavator Dredges	Trunnion.

To define the tracking point position, enter its offset distances from the vessel origin in the Mobile tab.

ASSIGNING DEVICES TO VESSELS

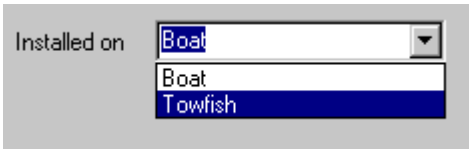
All devices must also be assigned to their vessel. Even though you may only have one vessel, you must designate a source driver for each information type listed in the table.

For each information type, the corresponding source field is a drop-down menu populated by the names of all devices for which you have selected

that function in its Device tab. Select the device which is measuring that information for the selected vessel.

In Basic Mode, this is fairly straight forward. Just select the appropriate vessel under 'Installed On' in each Device Tab".

FIGURE 2-19. *Basic Mode -- Assigning Devices to Your Mobile*



In **Advanced Mode**, you can select the driver from which each type of data will be read for the selected vessel in the Mobile Tab. In this example, both vessels read the tide information calculated by the GPS driver which is assigned to the boat. Tide is the same for both vessels so this method eliminates the need for an additional driver.

FIGURE 2-20. *GPS is Assigned to the Boat*

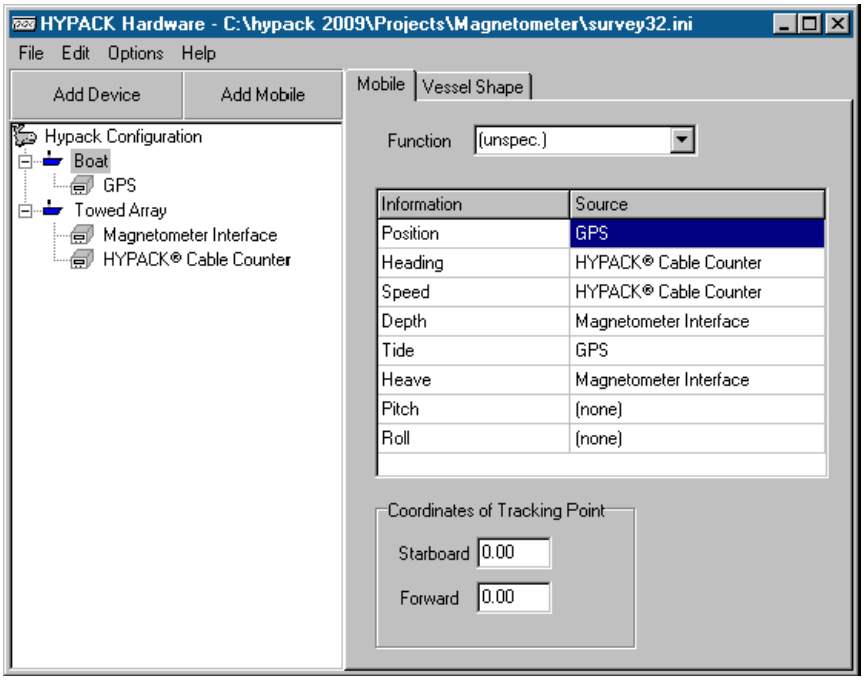
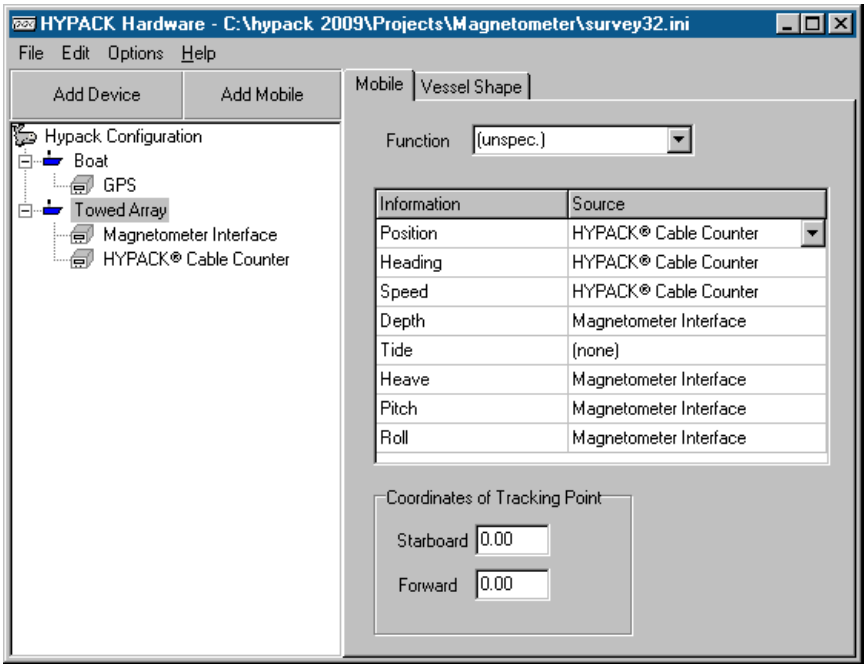


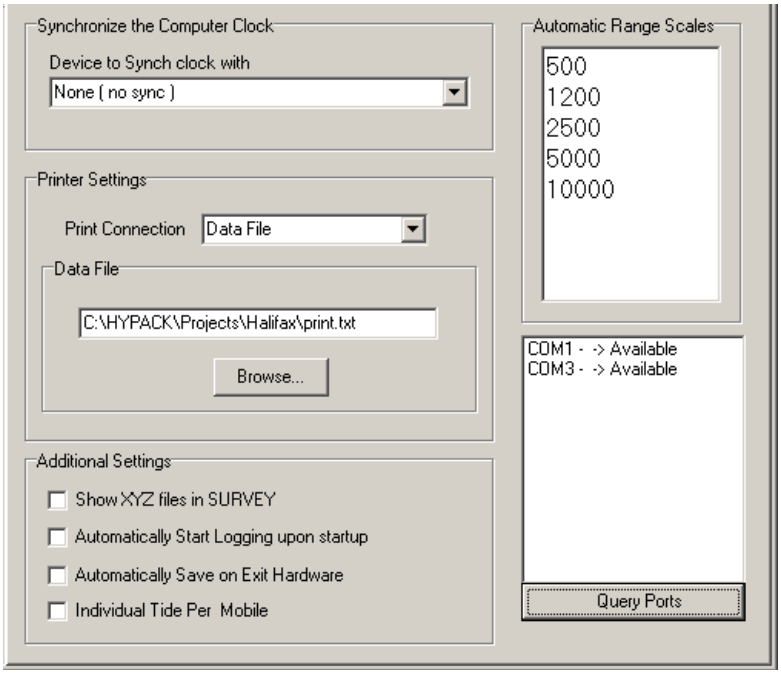
FIGURE 2-21. *Towcable and Magnetometer Drivers Provide Data for the Towfish*



SYSTEM SETTINGS IN HYPACK® HARDWARE

The System settings are accessed by selecting on “Hardware Configuration” in the tree view.

FIGURE 2-22. *Hardware System Settings*



Synchronize the Computer Clock prevents time drift between the GPS time and the computer time. It uses the UTC time in the ZDA message, the Windows® time zone setting and the GPS latency to calculate and set the computer time. This implements the ZDA time tagging technique. This is only available with the GPS device driver which can be used with either a DGPS or RTK system.

Some hardware configurations include more than one GPS. The drop-down list includes all configured GPS devices and you may choose to synchronize your clock to any one of them with the required output.

You should let SURVEY run for at least a minute to begin the process. From then on, the SURVEY program uses the UTC time contained in the GGA message as the time tag for the GPS position.

Beware!

BEWARE! Update settings *on your GPS* of faster than 1000 msec (or 1 Hz) when you are using the Sync. Clock feature may result in significant drift between the computer clock and GPS time.

NOTE This is different than the update frequency of the driver.

Printer allows you to send data string s to a printer during survey.

Experience tells us that this is usually difficult if not impossible. We recommend that you save your data to a text file and print it later.

COMQuery is used to check the availability of serial ports. Click [Query Ports] to display the available ports on your computer.

Automatic Range Scales determine the scale settings that will be available in the SURVEY toolbar. These are real-world distances used to quickly scale your Map window. SURVEY will automatically scale the selected Map window so the length of shortest side displays the selected range. The default values are 500, 1000, 2000, 3000 and 4000, but you can replace them with up to ten distances of your choice here.

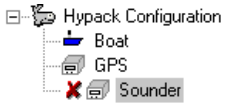
Additional Settings:

- **Show XYZ in SURVEY/DREDGEPACK**: Check this option and enable XYZ files in your HYPACK® display and they will also display in SURVEY's area map.
- **Automatically Start Logging upon Startup:** When you launch SURVEY, it will immediately begin logging
- **Automatically Save on Exit Hardware:** When you close HARDWARE, the program will save your current configuration without asking for confirmation.

DISABLING DEVICES IN THE HYPACK® HARDWARE SETUP

At times, you may want to temporarily ignore one or more devices in your setup. You could delete the driver from your setup, but then you would have to enter it with all of its settings when you want to reinstate it. An easier way to accomplish the same thing is to disable the device in the configuration.

In the Hardware dialog, right-click on the device in the list and check 'Disable' in the pop-up menu. A disabled device will remain in the devices list with a red 'X' marking it. SURVEY will display a blank device window for each disabled device.



When the device is disabled, HYPACK® will not read data from that device. When you are ready to include that data again, just right-click the device and check the 'Enable' option.

MANAGING HARDWARE CONFIGURATIONS IN HYPACK® HARDWARE

Your current hardware configurations are stored in the project's survey32.ini file. Each time you save a your settings in HYPACK® HARDWARE, they are recorded to this file. It is read by other programs to enable your data collection and by HARDWARE itself to display your settings when you re-open the program.

If you use a simple configuration, or are confident about your hardware setup, the Survey32.ini file may be the only hardware configuration file you ever need. However, there are some hardware management techniques that may prove useful.

MULTIPLE HARDWARE CONFIGURATIONS

Some survey vessels work with more than one hardware configuration as different devices or device combinations may be used on the same vessel. Instead of manually changing the individual devices and settings in HARDWARE each time, it is quicker and easier to save each complete configuration and load all of the settings at once when you switch devices or settings.

To save multiple device configurations:

1. **Enter all of your complete hardware configuration** in HARDWARE.
2. **Test the system to be sure it works**. This is optional, but always a good idea.
3. **Select FILE-SAVE AS and name your INI file**. It will be most useful if you name it in a way that you'll know which devices and settings it includes. The configuration file will be saved, by default, to your project folder. If the configuration will likely be used in multiple projects, consider saving it to \Hypack\Sample Setups to be included in the FILE-NEW menu.
4. **Repeat the process for each configuration**, using a unique name for each INI file saved.

There are two methods used to load an existing configuration:

- **The FILE-NEW menu** selection displays a menu of the configuration files stored in the \Hypack\Sample Setups folder. Remember if you select one of the HYPACK® generic configurations, you will need to modify the settings for your vessel. Once this is done, consider saving it to a new configuration file for easy reloading at a later time. The generic HYPACK® configurations return to their generic state.

Note: Take care not to overwrite the original generic configurations so they will be available the next time you need them.

- **The FILE-OPEN menu** selection defaults to your project directory. You typically use this option to reinstate configurations that you have saved.
  a. **Open HARDWARE and select FILE-OPEN**. You will be warned that your current configuration will be overwritten. If you want to excape and save the current configuration, click [No]. Otherwise, click [Ye**s].**
  b. **Select the INI file where you have stored the settings you need** and click [OPEN].
  c. **Test your system** before heading out to survey.

Restoring Device Configurations in HYPACK® HARDWARE

Occasionally, for any number of reasons, hardware configurations change in some manner and you can no longer collect the data you need. If you don't know what changes have occurred, it may be difficult or time-consuming to determine the cause, the HYPACK® HARDWARE 'Restore' function enables you to reinstate previous hardware configurations from your project.

Each time you close HYPACK® HARDWARE, the program saves a record of the settings with the time and date and you can restore a configuration based on the time and date it was recorded. Hopefully, this will be a quick and easy return to a working configuration.

To restore earlier settings, select FILE-RESTORE and select the survey32.ini from a date and time when your system was last working then test your system to see if your problem has been connected.

SIDE SCAN HARDWARE

The SIDE SCAN HARDWARE program is used to install those devices that are specific to side scan surveys. HYPACK® collects analog and digital side scan data through the SIDE SCAN SURVEY program, which is run together with HYPACK® SURVEY. Position and heading data is provided by SURVEY through the shared memory.

NOTE Side scan devices are supported by HYSWEEP® SURVEY. Therefore, if you are logging both side scan and multibeam data, you should load your side scan devices through HYSWEEP® HARDWARE and collect the data with HYSWEEP® SURVEY.

Most analog devices are supported by the Analog Side Scan option and an A/D card connection in your data collection computer.

NOTE Certain A/D adapters are not compatible with Windows® Vista.

---

1. **Open SIDE SCAN HARDWARE** by selecting SIDE SCAN-SIDE SCAN HARDWARE.
2. **Select your devices**.
   - Hypack Navigation for hull-mounted sonar
   - Hypack Mobile for towfish-mounted sonar
   - Sonar Model
   - MRU (Optional)
3. **For each device, specify the driver and communication settings**.
4. **Test the communication** between your devices and your survey computer.
5. **Enter your offsets**.
6. **Click [Close]** to exit SIDE SCAN HARDWARE.

Your hardware settings will automatically be saved to the Sidescan.ini when you exit and the same configuration will be reloaded when you re-open SIDE SCAN HARDWARE. However, if you frequently alternate between multiple configurations, you can manually save each configuration to a uniquely named file by selecting FILE-SAVE AS and naming your configuration file. You can then reload any configuration by selecting FILE-OPEN and selecting the appropriate configuration.

SPECIFYING DEVICES IN SIDE SCAN HARDWARE

Adding (and removing) devices is easy in the Manufacturer/Model tab. The HYPACK® Navigation driver is automatically included to provide positioning from SURVEY.

IMPORTANT: For towfish with depth sensors, you must also use the Hysweep device driver to pass the data to HYPACK® SURVEY.

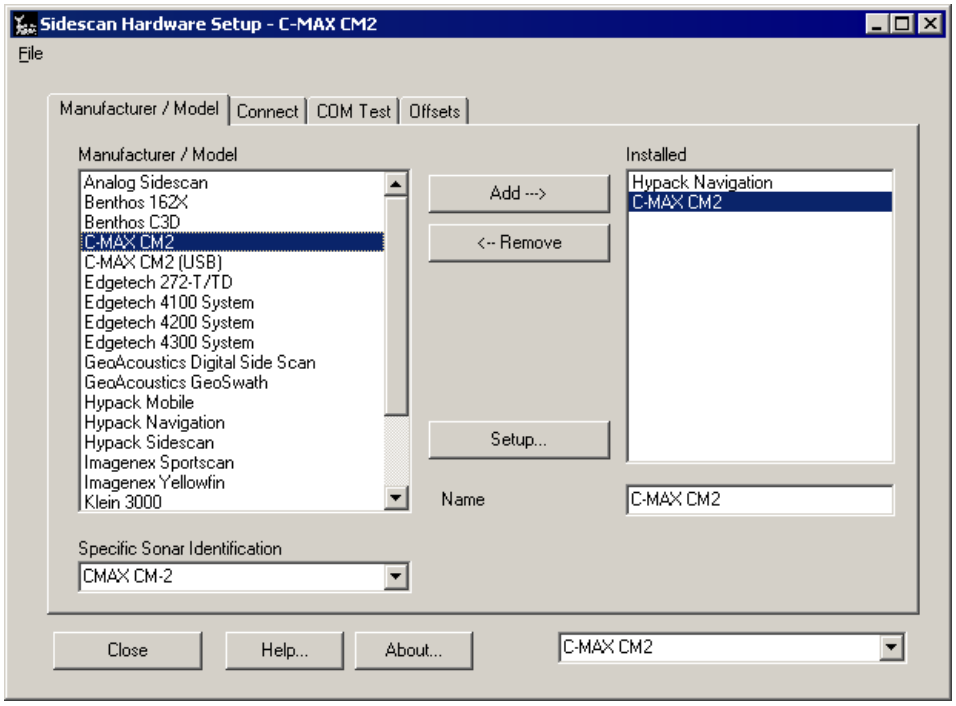
To add a device:

1. **Select the device in the left-side list then click [Add].** The device should write to the Installed list.
2. If [Setup] is enabled, the device requires additional setup specifications. **Click [Setup] and set the additional options**.
3. **If you are using GEOCODER™ with side scan data, check the device specified under 'Specific Sonar Identification' to be sure it matches the model you are using.** This is automatically filled when you add your device, but some drivers support more than one model. GEOCODER™ needs detailed information that may differ between models.
4. **Enter a name for your device. (Optional)** If you prefer a name other than the driver name, enter it here.

To remove a device:

Select the device name in the Installed list then click [Remove].

FIGURE 2-1. *The Manufacturer/Model Tab*



DRIVER SETUP IN SIDE SCAN HARDWARE

Some device drivers require settings specific to the device. In these cases, [Setup] is enabled. Click it and the Driver Setup dialog appears. Device-

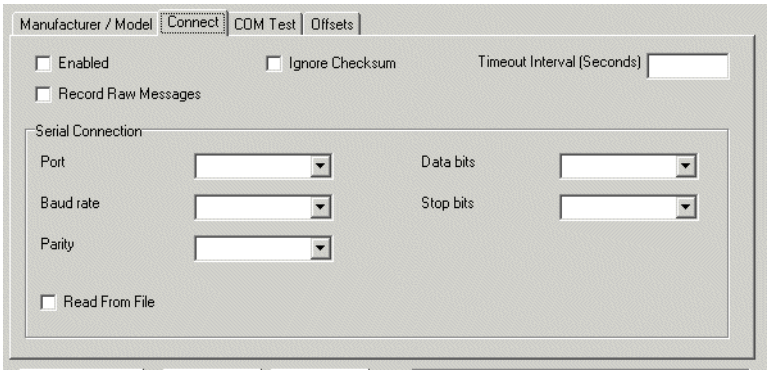
specific setup information can be found on our website (http://support.hypack.com/support/).

CONNECTION INFORMATION IN SIDE SCAN HARDWARE

Click the Connect tab to access device communication settings.

Connection settings are required for each serial or network device. Serial or Network connection options are included in this dialog according to your device.

FIGURE 2-2. *Serial Connections*



- **Enabled** in the upper left corner. Clear this selection to temporarily remove a device from the configuration without losing the device settings.
- **Ignore Checksum** is not recommended, but there are situations (normally testing) where the checksum is wrong, but the data is good.
- The **Timeout Interval** determines how long after the last data received from the device that the device alarm turns from green to red.

NOTE The interval for the Nav, MRU, Gyro, Sidescan and Multibeam alarms are fixed at 10 secs..

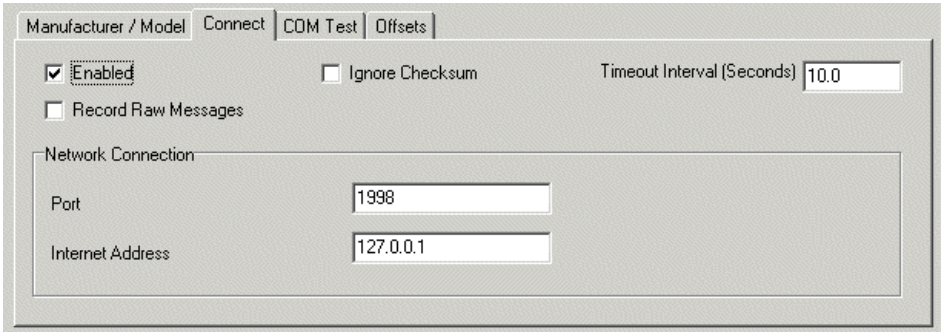
- **Record Raw Messages** saves the original data string as it is read from the device into the raw data file. (Binary data is output in hexadecimal format.)

Serial Connection Settings:

- **Port, Baud Rate, Parity, Data Bits, Stop Bits:** Enter your device settings. These should be in the information received from the device manufacturer.
- The **Read from File** checkbox enables you to simulate data input from this device by reading a file. Many times, when you are having a problem with a device in the field, we will ask you to log some of the output from the device to a file and upload it to us. We can then replay the information using the File setting to see what is happening.

Network device connections: Drivers specify the network connection automatically. Define the network settings in the Connect Tab.

FIGURE 2-3. *Network Connections*

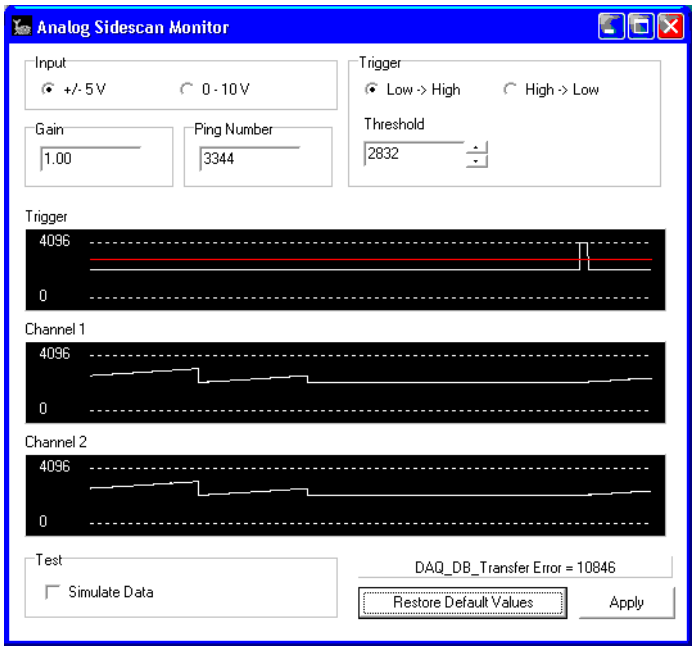


If you have a DNS server, you can define your destination computer by name or by IP Address. If you do not have a DNS server, you must include the IP Address. If these values are unknown, contact HYPACK, Inc. or the device manufacturer for help.

No Connection Some devices receive data from other places and no connection settings are necessary. Examples include:

- **Hypack Navigation** receives data from shared memory.
- **Hypack Mobile** receives data from shared memory. It *uses the first mobile in your hardware setup*. This mobile is typically associated with the Towcable device driver to calculate the towfish position.
- **Hypack Side Scan** converts analog side scan data from single beam devices with side scan capability that are configured in HYPACK® HARDWARE to SIDE SCAN SURVEY or HYSWEEP® SURVEY where it is stored to RSS records in the raw HSX file. When this driver is loaded, the Analog Side Scan program is automatically launched with SURVEY and the Analog Side Scan Monitor appears. This dialog enables you to monitor and control the device activity.

FIGURE 2-4. Analog Side Scan Monitor



Input: Select a -5 to +5 volt or 0 to 10 volt range according to the device specifications.

Gain: Multiplies signal by this amount. A value of 1.0 is usually the best choice.

Ping Number displays the sequential ping numbers.

Trigger: Choose whether the voltage changes from a lower to higher value or higher to lower.

Threshold: Enter the change in the strength of the return when it hits the bottom (the threshold) in A/D count. The value must be within the 0-4096 range.

The **graphs** allow you to monitor device activity.

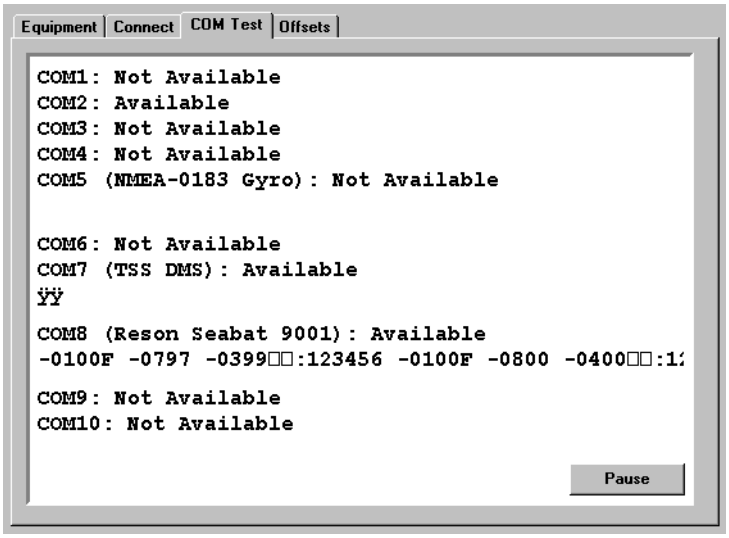
Test: Check the "Simulate Data" box for simulated side scan data.

TESTING SERIAL COMMUNICATION IN SIDE SCAN HARDWARE

The COM test shows status of serial communication ports 1 through 16. Ports shown as available are those that can be open for reading, although this can be misleading. Modems, for example, show up as available but are seldom used for device connection. Ports shown as not available are truly that.

Ports connected to working devices show the latest messages. ASCII devices send easy to read messages. Binary devices, which include all side scan devices, show garbled messages even when the data is good.

FIGURE 2-5. *The COM Test Tab*

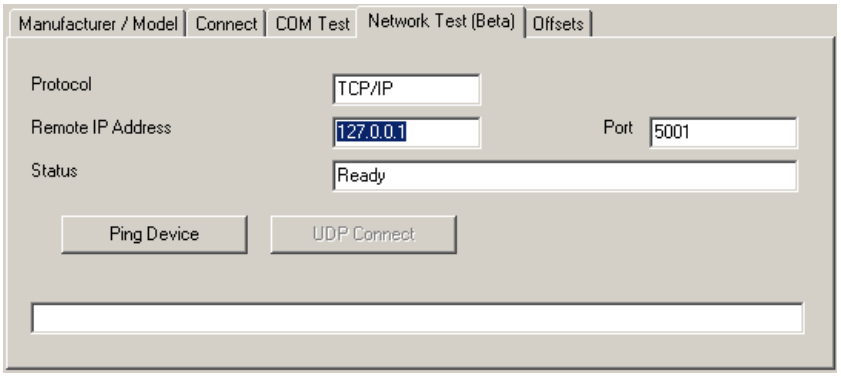


TESTING NETWORK CONNECTIONS IN SIDE SCAN HARDWARE

If you are using a network connection, you can test your settings by 'pinging' the IP Address to which you are connecting.

When you open the Network Test tab, it automatically displays the connect information you have entered in the Connect tab.

FIGURE 2-6. *Network Test Tab*



- **For TCP/IP connections**, click [Ping Device]. If the designated address is found, the status will read 'Ping OK'. If not, it will 'Time out waiting for a reply'.

  NOTE: If you leave the address at the default 127.0.0.1, you will ping your own computer and the status message will tell you it is not a remote address.

- **For UDP connections:**

- Click **[Ping]** to verify your address is valid as for the TCP/IP connections.
- Click **[UDP Connect]** to attempt to read incoming data from the UDP port. If the connection is successful, the status field will continuously update the number of messages and their size. Each message will display in the field at the bottom, though *it will not be text you can read*.

OFFSETS IN SIDE SCAN HARDWARE

Click the Offsets tab to enter device mounting offsets and latency times.

The **vessel origin** is the reference by which you position your devices and tracking point on your vessel. Each sensor is referenced to the origin based on the distance in survey units it is starboard (X-direction), forward (Y-direction) and vertically (Z-direction). Vertical offsets are measured from the static water line, and are always *positive downward*.

Beware!

BEWARE! With the 2006 release of HYPACK® *the convention for the vertical measurements has changed*. The value is *always positive downward.* If you open a project that pre-dates this change, check your vertical offsets--particularly your GPS antenna height--to be sure they conform to this standard.

FIGURE 2-7. *Sample configuration for a Multibeam or Side Hull-mounted Scan Hardware Setup*

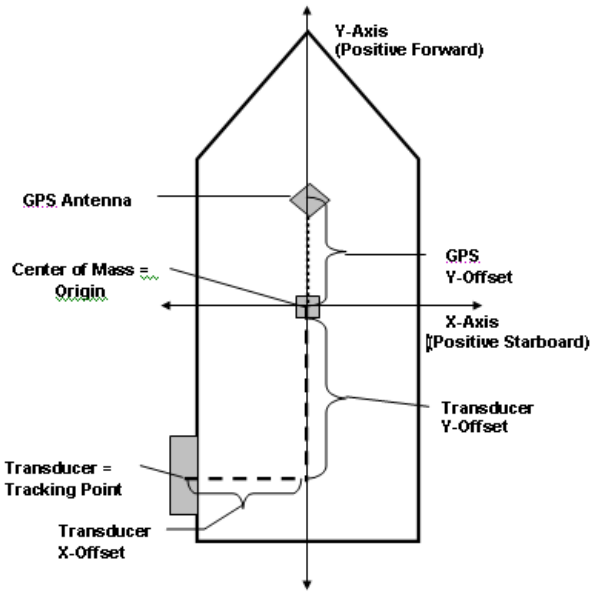
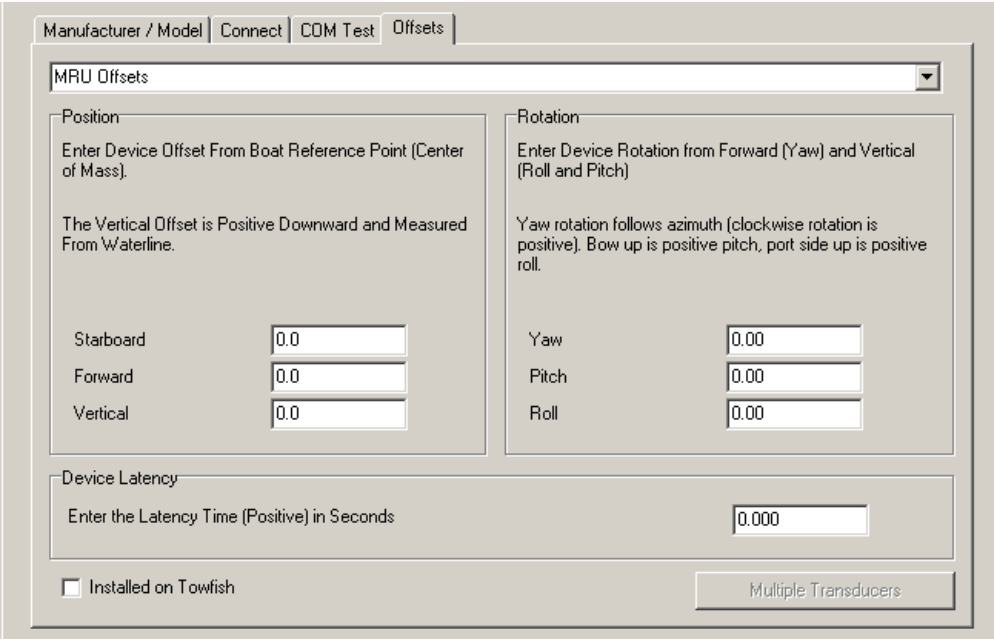


FIGURE 2-8. *Setting your Offsets*



The drop-down list at the top of the Offsets tab selects one of the offset points that apply to the device selected in the Manufacturer/Model tab.

Antenna Offsets:

GPS devices are configured in HYPACK® HARDWARE. However, in order for the position data to be recorded to the side scan raw data, you must install the HYPACK® Navigation driver in SIDE SCAN HARDWARE. In the Offsets tab for this driver select "Antenna Offsets".

- **Position offsets** are relative to the vessel's center of gravity.
- **Latency** is not measureable with side scan equipment.

NOTE HYPACK® and SIDE SCAN offsets do not affect each other. HYPACK® HARDWARE offsets will be applied to single beam data, while SIDE SCAN HARDWARE offsets will be applied to side scan data.

Sonar:

Sonar offsets are determined by whether the side scan is towed or hull-mounted.

Towed Sonar

Most side scans are towed devices.

Check the 'Installed on Towfish' checkbox and use the towcable driver to calculate the towfish position relative to the boat.

IMPORTANT: The 'Installed on Towfish' option *always* assigns the device to the first mobile (after the default 'boat') in your HYPACK® HARDWARE configuration. If you have more than one mobile, take care that the first mobile is configured for your side scan.

Hull-mounted Sonar

Side scan devices that are hull mounted are referenced to the vessel origin.

- **Position offsets** are relative to the vessel's center of gravity.
- Use **rotation offsets** of 0, 0, 0. We do not measure rotation offsets of side scan sonar at this time.

HYSWEEP® HARDWARE

HYSWEEP® HARDWARE is used to configure those devices that are specific to multibeam surveys. The procedure in HYSWEEP® HARDWARE is similar to that of the HYPACK® HARDWARE program.

1. **Open HYSWEEP® HARDWARE** by selecting HYSWEEP-HYSWEEP HARDWARE.
2. **Select your devices**.
3. **Specify the driver and communication settings**.
4. **Test the communication** between the devices and your survey computer.
5. **Enter measured offsets.**
6. **Calibrate your system and enter your offsets**.
7. **Exit HYSWEEP® HARDWARE**. by clicking [Close].

Your hardware settings will automatically be saved to the HYSWEEP.ini when you exit and the same configuration will be reloaded when you re-open HYSWEEP® HARDWARE. However, if you frequently alternate between multiple configurations, you can manually save each configuration to a uniquely named file by selecting FILE-SAVE AS and naming your configuration file. You can then reload any configuration by selecting FILE-OPEN and selecting the appropriate configuration.

You can easily modify HYSWEEP® HARDWARE settings by selecting the device name in the Installed List and changing the entries in associated dialogs. The new settings will be saved to the HYSWEEP.ini file when you exit HYSWEEP® HARDWARE.

SPECIFYING DEVICES IN HYSWEEP® HARDWARE

Adding (and removing) devices is easy in the Manufacturer/Model tab. The HYPACK® Navigation driver is automatically included to provide positioning from SURVEY.

IMPORTANT: For towfish with depth sensors, you must also use the Hysweep device driver to pass the data to HYPACK® SURVEY.

To add a device:

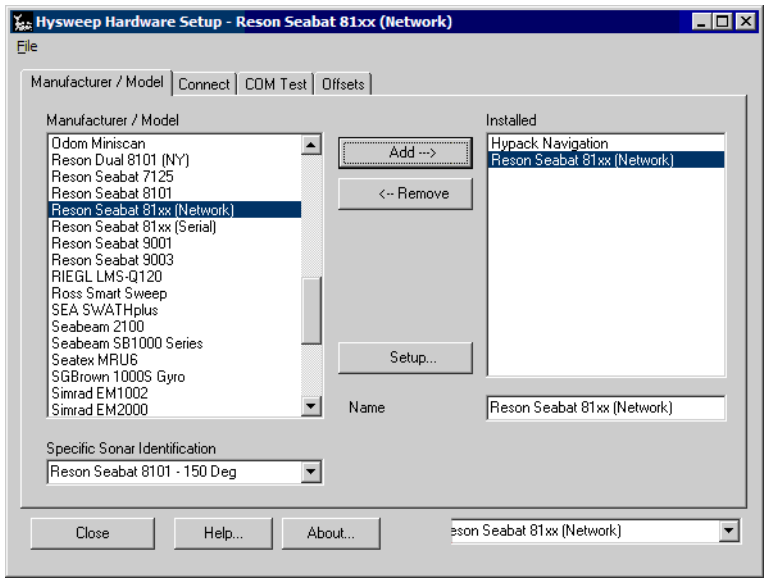
1. **Select the device in the left-side list then click [Add].** The device should write to the Installed list.
2. If [Setup] is enabled, the device requires additional setup specifications. **Click [Setup] and set the additional options**.
3. **If you are using GEOCODER™ with side scan data, check the device specified under 'Specific Sonar Identification' to be sure it**

matches the model you are using. This is automatically filled when you add your device, but some drivers support more than one model. GEOCODER™ needs detailed information that may differ between models.

4. **Enter a name for your device. (Optional)** If you prefer a name other than the driver name, enter it here.

To remove a device: **Select the device name in the Installed list then click [Remove].**

FIGURE 2-1. *The Manufacturer/Model Tab*



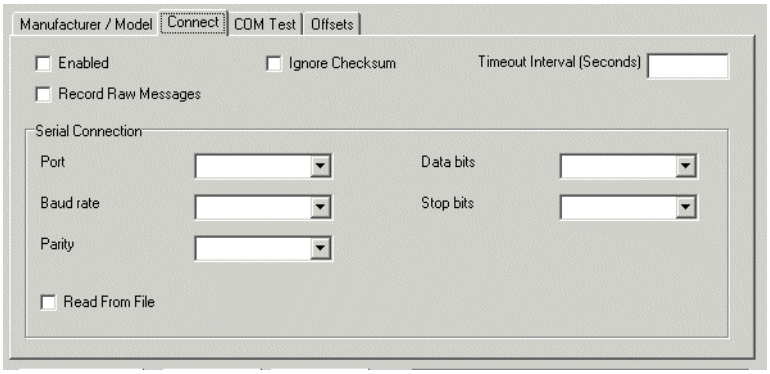
DRIVER SETUP IN HYSWEEP® HARDWARE

Some device drivers require settings specific to the device. In these cases, [Setup] is enabled. Click it and the Driver Setup dialog appears. Device-specific setup information can be found on our website (http://support.hypack.com/support/).

CONNECTION INFORMATION IN HYSWEEP® HARDWARE

Click the Connect tab to access device communication settings. Connection settings are required for each serial or network device. Serial or Network connection options are included in this dialog according to your device.

FIGURE 2-2. *Serial Connections*



- **Enabled** in the upper left corner. Clear this selection to temporarily remove a device from the configuration without losing the device settings.
- **Ignore Checksum** is not recommended, but there are situations (normally testing) where the checksum is wrong, but the data is good.
- The **Timeout Interval** determines how long after the last data received from the device that the device alarm turns from green to red.

NOTE The interval for the Nav, MRU, Gyro, Sidescan and Multibeam alarms are fixed at 10 secs..

- **Record Raw Messages** saves the original data string as it is read from the device into the raw data file. (Binary data is output in hexadecimal format.)

Serial Connection Settings:

- **Port, Baud Rate, Parity, Data Bits, Stop Bits:** Enter your device settings. These should be in the information received from the device manufacturer.
- The **Read from File** checkbox enables you to simulate data input from this device by reading a file. Many times, when you are having a problem with a device in the field, we will ask you to log some of the output from the device to a file and upload it to us. We can then replay the information using the File setting to see what is happening.

Network device connections:

Drivers specify the network connection automatically. Define the network settings in the Connect Tab.

FIGURE 2-3. *Network Connections*

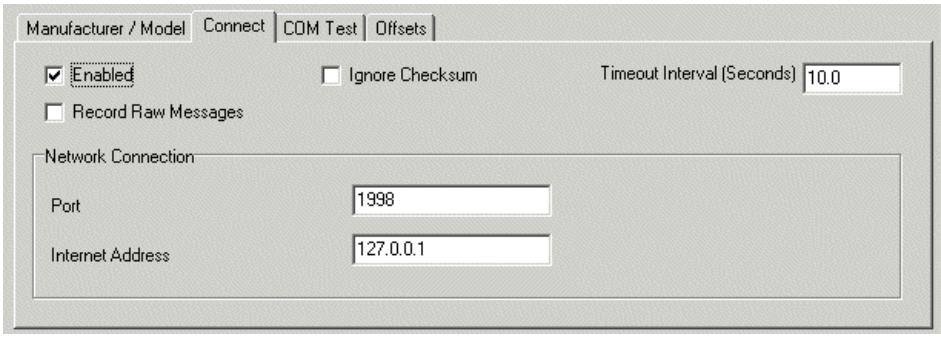


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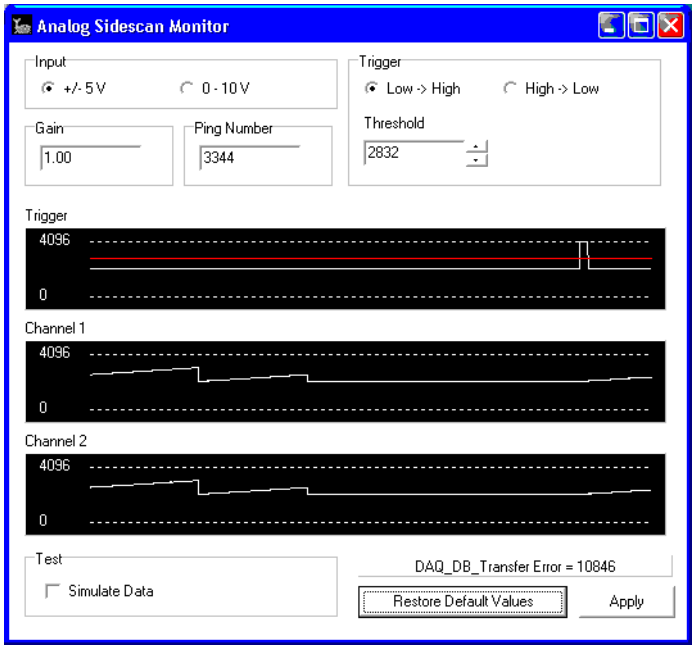
FIGURE 2-4. *Analog Side Scan Monitor*



Input: Select a -5 to +5 volt or 0 to 10 volt range according to the device specifications.

Gain: Multiplies signal by this amount. A value of 1.0 is usually the best choice.

Ping Number displays the sequential ping numbers.

Trigger: Choose whether the voltage changes from a lower to higher value or higher to lower.

Threshold: Enter the change in the strength of the return when it hits the bottom (the threshold) in A/D count. The value must be within the 0-4096 range.

The **graphs** allow you to monitor device activity.

Test: Check the "Simulate Data" box for simulated side scan data.

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The COM test shows status of serial communication ports 1 through 16. Ports shown as available are those that can be open for reading, although this can be misleading. Modems, for example, show up as available but are seldom used for device connection. Ports shown as not available are truly that.

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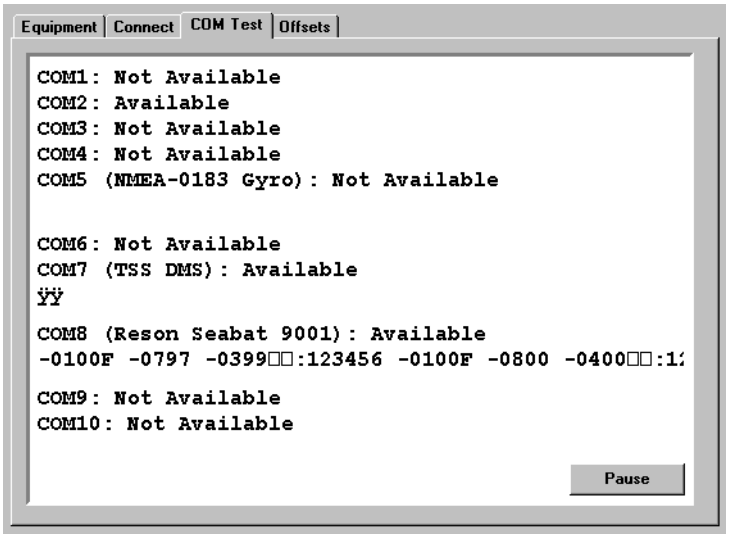
FIGURE 2-5. *The COM Test Tab*

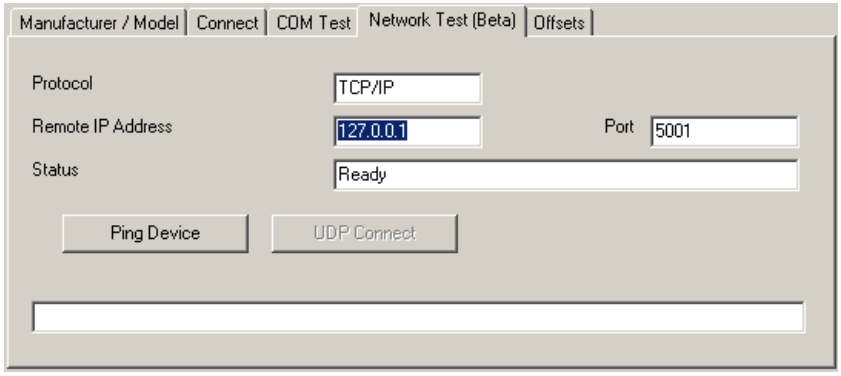


TESTING NETWORK CONNECTIONS IN HYSWEEP® HARDWARE

If you are using a network connection, you can test your settings by 'pinging' the IP Address to which you are connecting.

When you open the Network Test tab, it automatically displays the connect information you have entered in the Connect tab.

FIGURE 2-6. *Network Test Tab*



- **For TCP/IP connections**, click [Ping Device]. If the designated address is found, the status will read 'Ping OK'. If not, it will 'Time out waiting for a reply'.

  NOTE: If you leave the address at the default 127.0.0.1, you will ping your own computer and the status message will tell you it is not a remote address.

- **For UDP connections:**

- Click **[Ping]** to verify your address is valid as for the TCP/IP connections.
- Click **[UDP Connect]** to attempt to read incoming data from the UDP port. If the connection is successful, the status field will continuously update the number of messages and their size. Each message will display in the field at the bottom, though *it will not be text you can read*.

OFFSETS IN HYSWEEP® HARDWARE

Click the Offsets tab to enter device mounting offsets and latency times.

The **vessel origin** is the reference by which you position your devices and tracking point on your vessel. Each sensor is referenced to the origin based on the distance in survey units it is starboard (X-direction), forward (Y-direction) and vertically (Z-direction). Vertical offsets are measured from the static water line, and are always *positive downward*.

Beware!

BEWARE! With the 2006 release of HYPACK® *the convention for the vertical measurements has changed*. The value is *always positive downward.* If you open a project that pre-dates this change, check your vertical offsets--particularly your GPS antenna height--to be sure they conform to this standard.

FIGURE 2-7. *Sample configuration for a Multibeam or Side Hull-mounted Scan Hardware Setup*

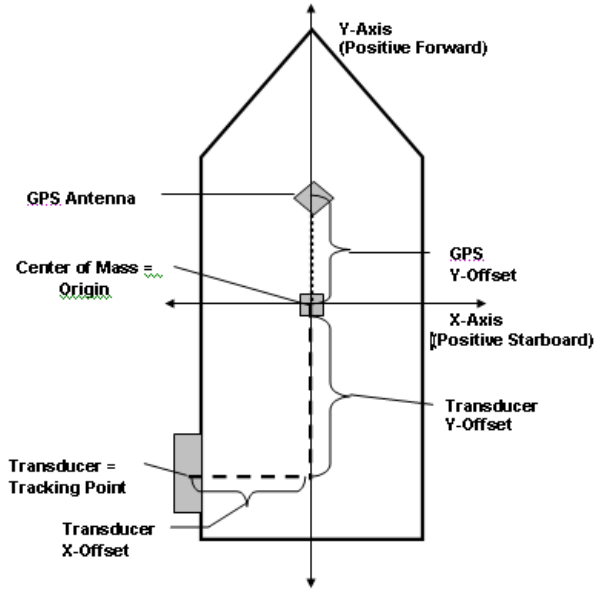
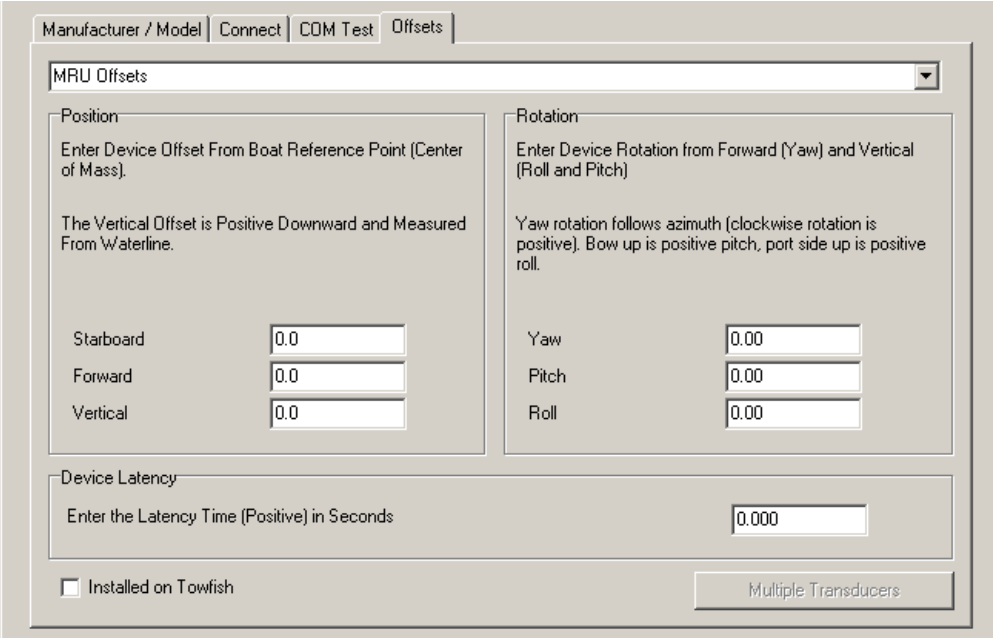


FIGURE 2-8. *Setting your Offsets*



The drop-down list at the top of the Offsets tab selects one of the offset points that apply to the device selected in the Manufacturer/Model tab.

Antenna Offsets:

On a multibeam vessel, HYSWEEP® HARDWARE and HYPACK® HARDWARE use the same boat origin—the horizontal position of the MRU at the level of the static water line.

The offsets for a device on the towfish is measured from the cable anchoring point on the towfish.

Check the 'Installed on Towfish' checkbox and use the towcable driver to calculate the towfish position relative to the boat.

IMPORTANT: The 'Installed on Towfish' option *always* assigns the device to the first mobile (after the default 'boat') in your HYPACK® HARDWARE configuration. If you have more than one mobile, take care that the first mobile is configured for your side scan.

GPS devices are configured in HYPACK® HARDWARE. However, in order for the position data to be recorded to the multibeam rawdata, you must install the HYPACK® Navigation driver in HYSWEEP® HARDWARE. In the Offsets tab for this driver select "Antenna Offsets" and set the antenna location.

- **Position offsets** are relative to the vessel's center of gravity.
- **Latency**: Although latency is a lag time (a negative time offset), the convention is to enter latency as a positive number. If you are preparing to enter a negative latency, stop and re-figure. *Enter the same latency value here as you have in HYPACK® HARDWARE.*

NOTE The offsets in HYPACK® HARDWARE and HYSWEEP® HARDWARE do not affect each other. HYPACK® HARDWARE offsets will be applied to single beam data, while HYSWEEP® HARDWARE offsets will be applied to multibeam data.

Heading Offset (Yaw): Applies to gyros and other heading devices. Rotation is required to measure heading relative to grid north. Use 0, 0, 0 and calibrate the gyro to true north.

MRU Offsets: Applies to devices that measure heave, pitch and roll . This is the physical location and orientation of the box relative to the keel.

- **Position offsets** are relative to the vessel's center of gravity.
- Rotation offsets: Use 0, 0, 0 and calibrate the MRU to reset it's pitch and roll zeros.

Sonar Head: The physical location and orientation of the sonar head.

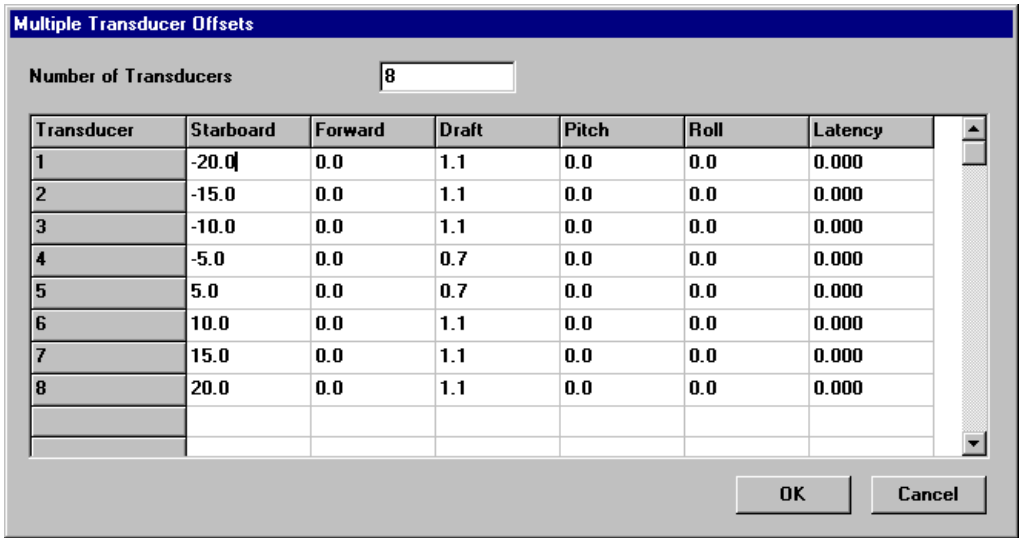
- **Position offsets** are relative to the vessel's center of gravity.
- Use **rotation offsets** of 0, 0, 0 initially, then find the true rotations with the Patch Test.

Towed Devices: Check the 'Installed on Towfish' checkbox and use the towcable driver to calculate the towfish position relative to the boat.

IMPORTANT: The 'Installed on Towfish' option *always* assigns the device to the first mobile (after the default 'boat') in your HYPACK® HARDWARE configuration. If you have more than one mobile, take care that the first mobile is configured for your side scan.

Multiple Transducer Offsets If the device is a multiple transducer sonar system, [Multiple Transducers] is enabled. Click it to show the Multiple Transducer Offsets form

FIGURE 2-9. *Multiple Transducer Offsets*



Enter the number of transducers, then the position offsets of each transducer. The roll and pitch offsets are included but seldom used.

More Information

- "Measuring Offsets in HYPACK® HARDWARE" on page 2-133
- "Assigning the Tracking Point" on page 2-142

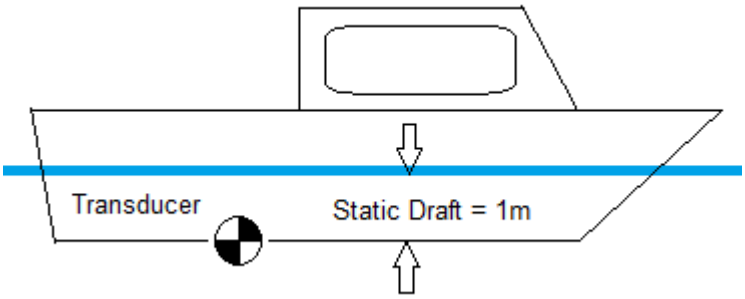
CALIBRATING YOUR HARDWARE

Before surveying, you should first confirm that the required offsets are as accurate as possible. Calibration tests provide accurate measurements which you will enter in your hardware configuration.

Depth sent to the computer is sum of the measured depth from the transducer to the bottom transducer and the static draft correction.

The 'Static Draft' represents the vertical offset of the transducer beneath the static waterline. 'Static' refers to the fact that the vessel is not moving.

FIGURE 2-1. *Static Draft*



In HYPACK®, Static Draft (and Dynamic Draft) are measured positive downwards. The deeper the transducer is beneath the static waterline, the larger (more positive) the Static Draft Correction.

Static Draft can be corrected in one of two different methods in HYPACK®.

- **Enter the Static Draft adjustment into the Echosounder and set the vertical offset for the echosounder to 0.00 in the HYPACK® HARDWARE program.** Most surveyors use this method. The echosounder will then output a sounding that incorporates the static draft.
- **Set a Static Draft adjustment of 0.00 into the Echosounder and enter the static draft as the vertical offset into HYPACK®.**

Beware!

BEWARE! Do one or the other, *but not both*. Otherwise, you will be double-correcting for the Static Draft.

NOTE: If you are using Real Time Kinematics referencing the water line, you must include the static draft in your echosounder to get the correct tide information.

For single beam systems:

- The **LATENCY TEST** measures the GPS latency offset. Enter the results in HYPACK® HARDWARE.

- The **bar check** measures the static draft for your echosounder. You can enter this distance *either* in your echosounder, so it will output depths corrected for static draft, or as the vertical offset for your echosounder in HYPACK® HARDWARE, so SURVEY will correct the depth for static draft.

Beware!

BEWARE! Do one or the other, *but not both*. Otherwise, you will be double-correcting for the Static Draft.

For multibeam systems:

- The **PATCH TEST** measures your GPS latency as well as the rotational alignment of the system with the keel. While it is difficult to accurately measure the angular mounting components (roll, pitch, and yaw) of multibeam systems, errors in these measurements can lead to inaccurate surveys. The patch test is a data collection and processing procedure to calibrate these angles, along with positioning system latency.
- The **bar check** measures the static draft for your echosounder. The Bar Check routine in HYSWEEP® SURVEY enables you to calibrate your multibeam echosounder, incorporating the static draft into the device, and save documentation of the process. Once this process is accomplished, your echosounder will output soundings that have static draft corrections factored into the output depth. In HYSWEEP® HARDWARE, the vertical offset should then be set to '0.00' to avoid double-correction.

In dredging projects, the angle sensors must be calibrated to set the '0' depth at the water surface. This calibration is included in the driver configuration routines in HYPACK® HARDWARE. Unfortunately, dredge equipment and configurations are so varied, there are no standardized calibration methods. Please contact Technical Support for assistance.

MEASURING GPS LATENCY IN SINGLE BEAM CONFIGURATIONS

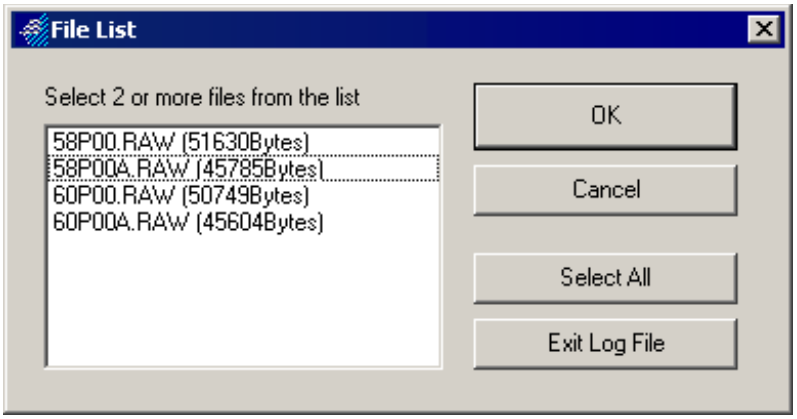
The **Latency Test** is used to determine the "fixed" delay time between the GPS and singlebeam echosounder. This value is typically positive.

The latency correction is used in HARDWARE to adjust the "latency" time in the Offsets dialog for the positioning device. It represents a combined delay time between the GPS and echosounder. This method works well on GPS systems that have a constant latency time and for surveys at scales of 1:5,000 to 1:100,000.

In the event that you have collected data with incorrect latency settings, you can adjust the latency in the SINGLE BEAM EDITOR which will correct the resultant edited data, but the raw data will remain unchanged.

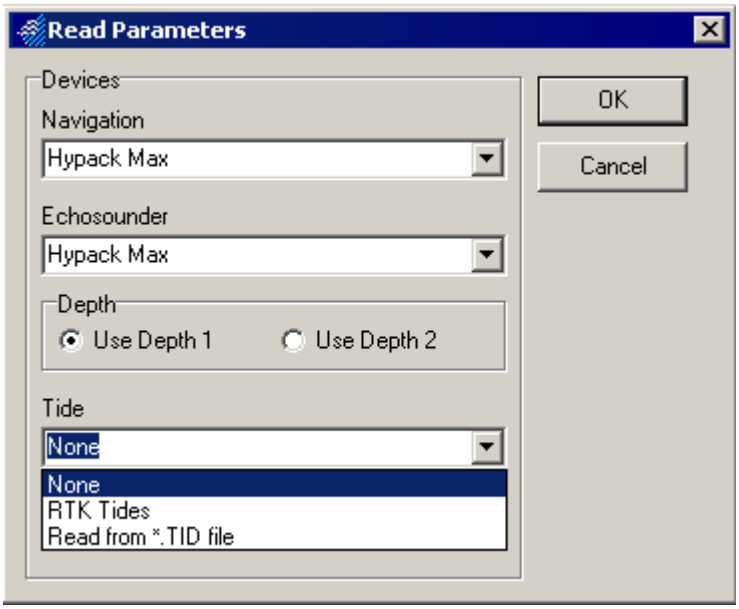
1. **Run reciprocal lines over a changing bottom**. Run the same line up and down over a sloping bank or over a prominent bottom feature. For the best results:
   - **Collect your data at slack tide** when the water level changes slowly.
   - **Follow the planned line** as exactly as possible.
   - **Monitor the number of satellites read by your GPS.** You can set your system to log data based on the HDOP or number of satellites in the Alarm tab of the driver setup dialog for the kinematic.dll or GPS.dll.
2. **Open the program** by clicking UTILITIES-CALIBRATION-LATENCY TEST.
3. **Select FILE-OPEN SOUNDING CATALOG and select the .LOG file** containing your latency test lines.
4. **Click [OK].** A list of files will appear.

FIGURE 2-2. *Sounding Catalog in LATENCY TEST*



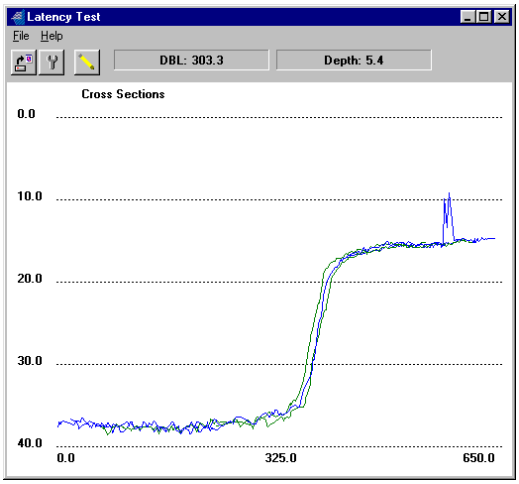
5. **Click on the two files to be used for the latency calculation and click [OK].** After the first file header is read, the Read Parameters dialog appears.

FIGURE 2-3. *Latency Read Parameters Dialog*



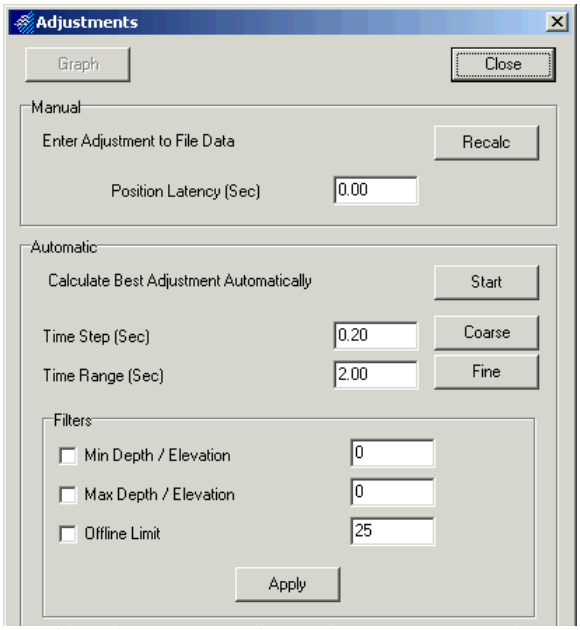
6. **Set your Read Parameters and click [OK] to continue.** A cross section graph will display the profiles of your two survey lines. You may notice the sections are not "aligned" meaning there is an error in the latency time setting.
   - **Select the devices whose data you are using.** Make sure you have selected the single beam echosounder. If your data files were collected over an area of fluff, use Depth 2 for the calculation.
   - **Choose a Tide Correction method**.
     - **None**: If you collect your test data at slack tide, you should be able to get fairly accurate results without accounting for tide.
     - **RTK Tides**
     - **Read from TID file**: Reads the corrections from a tide correction file that you typically generate from tide gauge data in the MANUAL TIDES program.

FIGURE 2-4. *Graph displaying the results of Coarse Adjustments*



7. **Select FILE - ADJUSTMENTS** (or click the wrench icon) to display the Adjustments dialog.

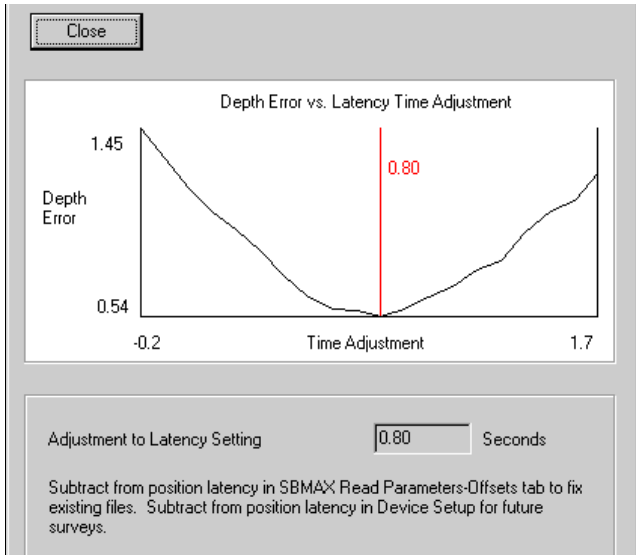
FIGURE 2-5. *Latency Adjustments Dialog*



8. **Set Filters to omit obvious bad soundings**. You can set filters for minimum and maximum depth or elevation, and for soundings farther off line than the user-defined limit.
9. **Perform Coarse Adjustments**.
   a. Click [Coarse] to select Coarse Adjustment Settings. The settings will be automatically calculated.
   b. Click [Start] to begin calculations. When they are completed, a graph will appear showing the results.
   c. Click [Close] to return to the Adjustments dialog.
10. **Perform Fine Adjustments**.

a. Click [Fine].
b. Click [Start] to test using the Fine settings. When the soundings are redrawn, the banded pattern is gone, giving you a value to be used as your latency setting as in the following figure.

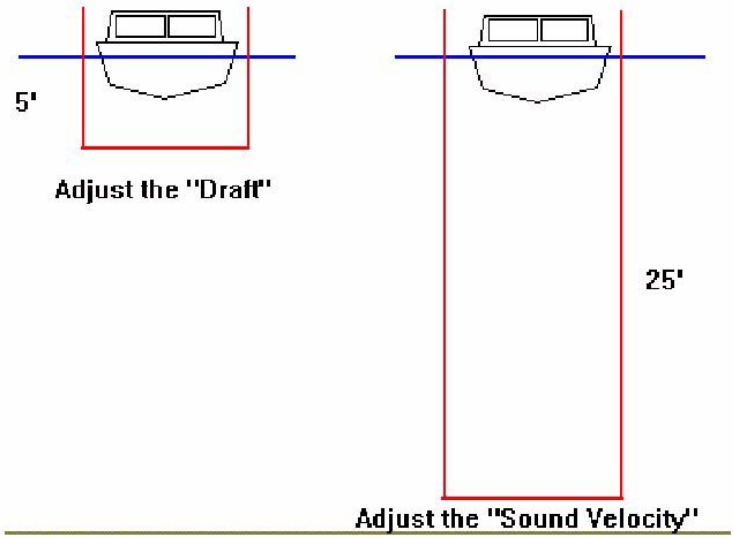
FIGURE 2-6. *Latency Value*



BAR CHECKS

Most single beam, dual frequency and multiple transducer systems are calibrated by lowering a plate a fixed distance below the transducer then adjusting the “draft” and “sound velocity” settings on the echosounder. The procedure is summarized in the following example where we will use 5 and 25 foot depths.

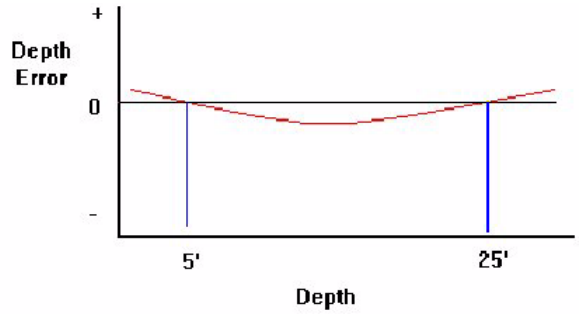
FIGURE 2-7. *Bar Check Calibration*



1. **Lower a bar or disk directly below the transducer to a predetermined depth.** (Keep the bar close enough to the transducer so that sound velocity errors don't enter into this.)
2. **Adjust the Draft setting** on your echosounder until the paper chart/ digitizer reads the correct depth. In this example, the depth is 5 feet. This incorporates the static draft into your echosounder readings; the vertical offset for your echosounder in HYPACK® HARDWARE will be '0'.
3. **Lower the bar/disk to a depth that is approximately the depth of your channel.** In our example, we have lowered it to 25 feet.
4. **Adjust the Sound Velocity setting** until your echosounder reads 25 feet.
5. **Return the bar/disk to 5 feet and check the depth.** It may have changed, since you just changed the sound velocity.
   - **If the depth has not changed**, your echosounder is calibrated and you may begin work.
   - **If the depth has changed**, repeat the process (steps 1-4) until the sounder accurately reports the 5-foot and 25 foot levels.

Using this process, you now have an echosounder that is calibrated at 5 feet and 25 feet. Assuming the sound velocity is constant through the water column, it should also be calibrated for the depths between this range. If sound velocity is not a constant through these ranges, your intermediate depths may have small errors.

FIGURE 2-8. Slight depth errors occurring due to sound velocity factors



NOTE: Another method used for calibrating your echosounder is to set the sounder for a fixed velocity (for example 1500m/s or 4800 ft/s) and then use a sound velocity profile to adjust the depths in real time or post processing. The sounder is first calibrated using the process described above. This finds the electronic draft of the sounder. After calibration, the velocity is then set at a recommended level. Measured depths are later adjusted based on the initial setting and the sound velocity profile to determine the final measured depth.

More Information

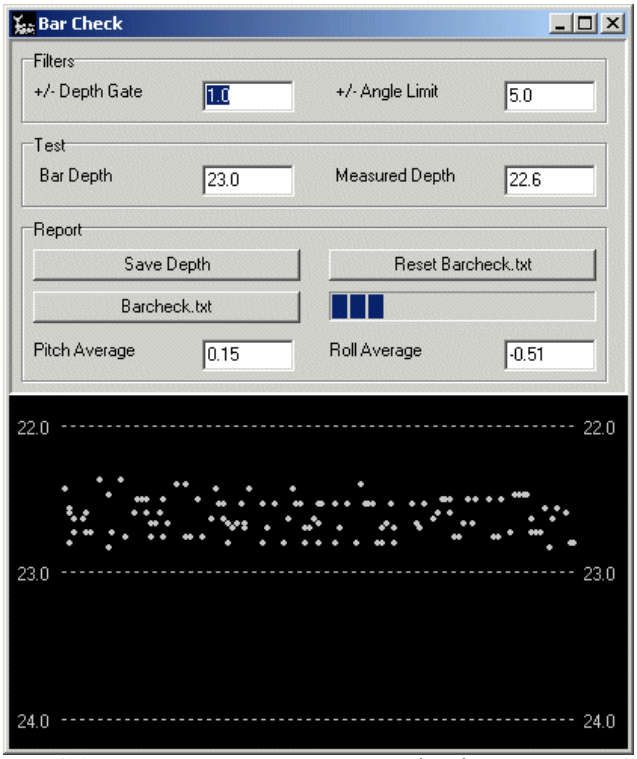
"Multibeam Bar Check Tool" on page 2-175

MULTIBEAM BAR CHECK TOOL

The Bar Check routine, in the HYSWEEP® SURVEY, enables you to calibrate your echosounder and save documentation of the process. Once this process is accomplished, your echosounder will output soundings that have draft corrections factored into the output depth.

1. **Open the Bar Check program** by selecting TOOLS-BAR CHECK. The Bar Check window will appear.

FIGURE 2-9. *Bar Check Window*



2. **Click [Reset Barcheck.txt]** to begin a new Bar Check Report.
3. **Set your filters**.
   - **Depth Gate** determines the scope of the display in the lower part of the window.
   - **Angle Limit** defaults to 75 degrees. If you see indications on the sides that the outer beams are inaccurate you may need to narrow your focus. We have seen instances where, at 75 degrees, the outer beams were hitting the chains suspending the bar thus affecting the accuracy of the test.
   - **Bar Depth** is the depth at which the bar is currently set.
   - **Measured Depth** is a calculated average of all sounding data over the three-second interval.
4. **Set your Bar Depth** just a short distance below the transducer (eg. 5 feet), enter the same depth in the Bar Check dialog under Test Bar Depth and watch the data on the screen.
5. **When the Measured Depth stabilizes**, **if the Measured Depth does not approximate the Test Bar depth**, adjust the *draft* on the echosounder until it does.

Beware!

BEWARE! Performing the calibration in this manner means that the sounder will output "draft corrected" depths. In this case, the **Height or Depth offset should be set to "0.00"**. The survey programs add the Height (Depth) offset to the received depth. If the draft has already been incorporated into the echosounder and is also entered as a draft/squat correction in SURVEY. It will result in the draft being applied twice.

6. **When the Measured depth approximately equals the Bar Depth**, **click [Save Depth].** This saves statistical documentation about the data gathered by each beam over the past three seconds.
7. **Reset your Bar Depth at a depth approximating the maximum survey depth for your project.**
8. **When the Measured Depth stabilizes**, **if the Measured Depth does not approximate the Test Bar depth**, adjust the *sound velocity* on the echosounder until it does.
9. **Recheck at the first depth.**
10. **Repeat steps 4 and 5 at each Bar Depth** for which statistics are required.
11. **When the test is complete, click [Barcheck.txt]** to view and print the stored data in Windows® Notepad.

More Information

"Bar Checks" on page 2-173

MULTIBEAM PATCH TEST

While it is difficult to accurately measure the angular mounting components (roll, pitch, and yaw) of multibeam systems, errors in these measurements can lead to inaccurate surveys. The PATCH TEST is a data collection and processing procedure to calibrate these angles, along with positioning system latency.

In the latency test, we successively modify GPS latency by the time step for the number of steps selected using the original GPS latency time as the center time. At each step, the depth profiles are recalculated and drawn in cross section, so that the number of cross-sections equals the number of time steps.

In yaw, roll and pitch tests, we successively modify the respective mounting angles by angle step for the number of steps selected. Again, at each step the depth profiles are recalculated.

Multibeam offset adjustments are calculated with the PATCH TEST in phase 3 of the HYSWEEP® EDITOR.

The error term for each test comes from comparing the 2 files contained in each cross section. It is simply the average depth error between files.

PATCH TEST PROCEDURE

1. **Collect survey data in the prescribed pattern**.
2. **Process the data in the HYSWEEP® EDITOR through all three phases of the editing process**. At this point, the Patch Test option will be enabled.

Typically, you will load two lines of raw test data at a time to the HYSWEEP® EDITOR according to which offset you are testing. If you have a dual head system, it also depends on the head for which you are testing. Use the HYSWEEP® EDITOR to apply your sound velocity and tide corrections and remove all spikes and outliers. After you have completed phase 3 of the HYSWEEP® EDITOR editing, run the Patch Test from the HYSWEEP® EDITOR Tools menu.

You can use files that have been previously edited in the old HYSWEEP® EDITOR or have gone through a sounding reduction program which saves its results in XYZ format.

3. **Run the Patch Test** which will calculate offset adjustment values for latency, pitch, roll and yaw.
4. **Enter the adjustment values in the Offsets Dialogs in the HYPACK® HARDWARE and HYSWEEP HARDWARE** programs.
5. **Correct the offsets in data collected with incorrect offsets in post-processing.** Enter the correct offsets in the Offsets Tab of the Read Parameters dialog of the SINGLE BEAM EDITOR or the HYSWEEP® EDITOR. This process corrects only the edited data. The Raw data will remain unchanged.

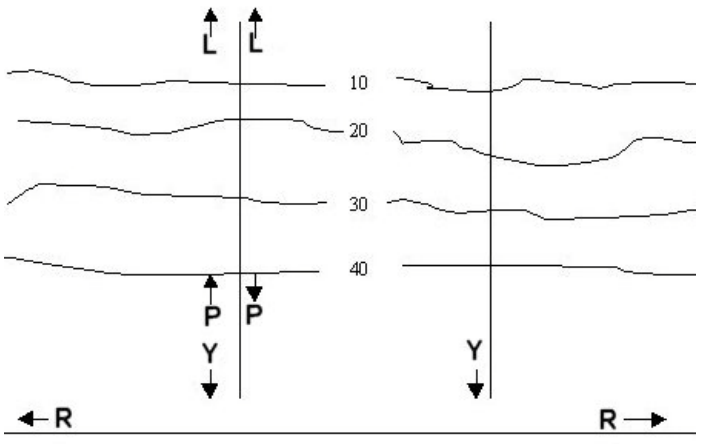
More Information

- "Basic Acoustics for the Hydrographer" on page 10-87

PATCH TEST DATA COLLECTION

Lines, 200-300 feet (100 m) are run over specific bottom terrain in a specific way for each offset.

FIGURE 2-10. *Map View of Patch Test Survey Lines (single head transducer) with Bottom Contours.*



(R) Roll , (L) Latency, (P) Pitch , and (Y) Yaw Test Lines

TABLE 2-1. *Single Head Transducer Data Collection Specifications*

Offset	Collection Specifications
Latency	• Perpendicular to a slope • Run same line twice in the same direction • One line at maximum survey speed and one as slowly as possible
Pitch	• Perpendicular to a slope • Run same line twice in opposite directions • Normal survey speed
Roll	• Over Flat bottom • Run same line twice in opposite directions • Normal survey speed
Yaw	• Perpendicular to a slope • Two parallel lines spaced at a distance equal to the channel depth. • Run each line in the same direction • Normal survey speed

The data collection pattern for a dual head multibeam system is a little different than for the single head system in order to overlap the soundings and Patch Test for head 1 and head 2 separately.

FIGURE 2-11. *Roll data (left), and* ***Y****aw,* ***L****atency,* ***P****itch (right)*

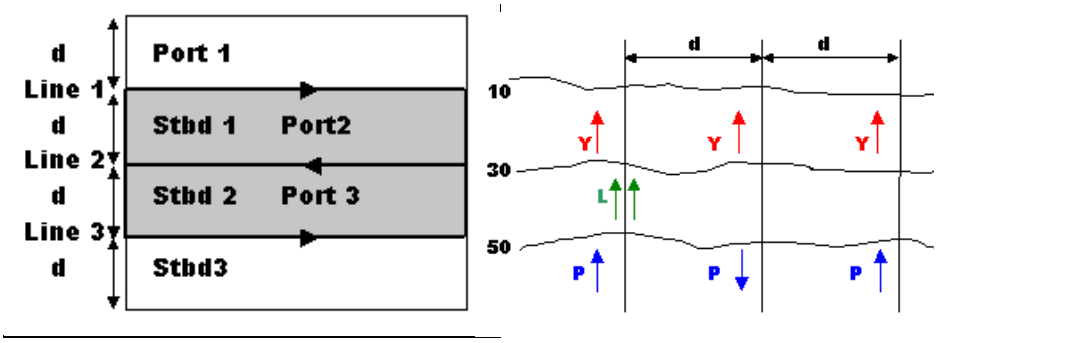


TABLE 2-2. Dual Head Transducer Data Collection Specifications

Offset	Test Specifications
Latency	• Perpendicular to a slope • Run same line twice in the same direction • One run at maximum survey speed and one as slowly as possible
Pitch	• Perpendicular to a slope • Three parallel lines spaced at a distance equal to the channel depth • Run in alternating directions • Normal survey speed
Roll	• Over Flat bottom • Three parallel lines spaced at a distance equal to the channel depth • Run in alternating directions • Normal survey speed
Yaw	• Perpendicular to a slope • Three parallel lines spaced at a distance equal to the channel depth • Run all in the same direction • Normal survey speed

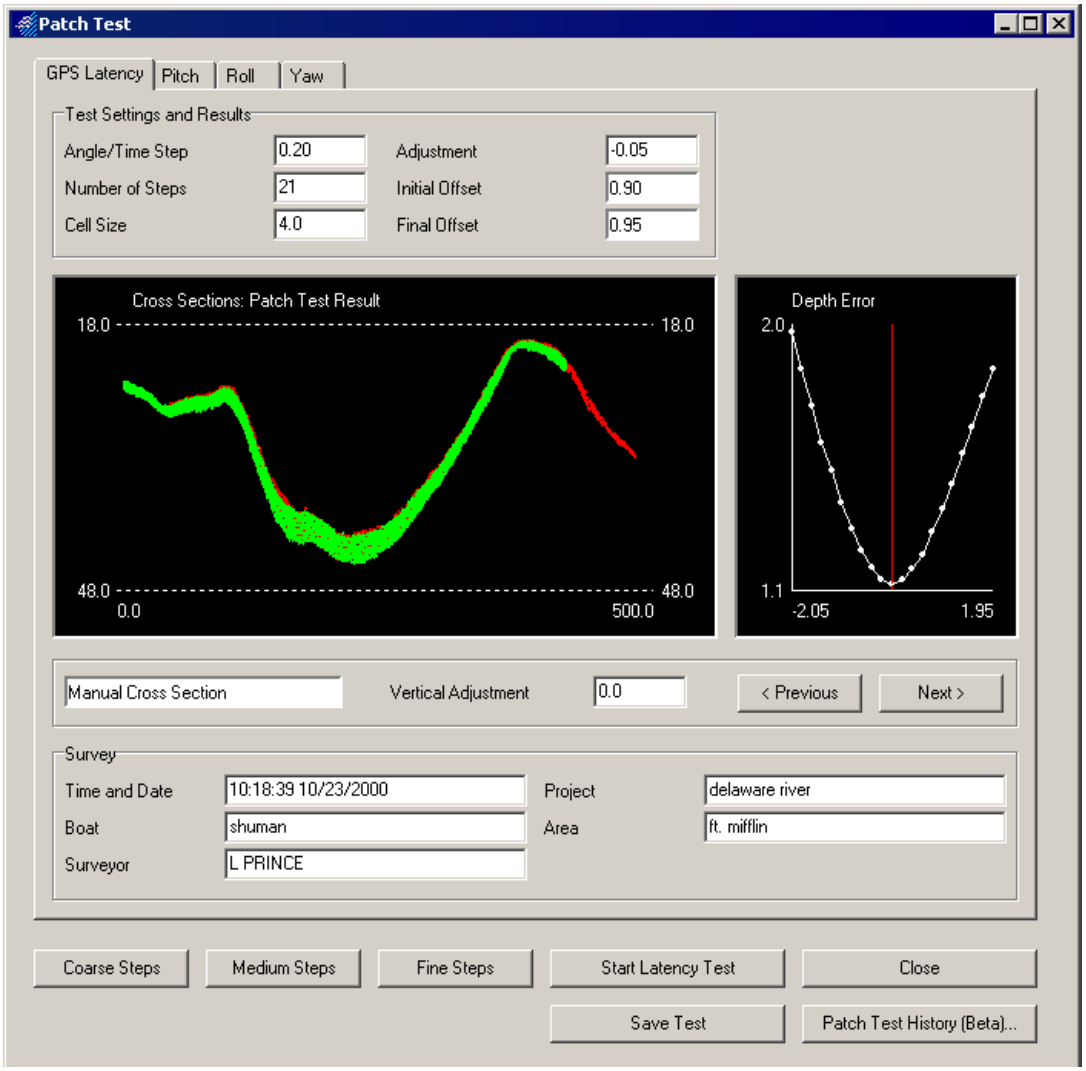
For optimal results, consider the following:

- **Verify the multibeam power and gain settings** before data collection to minimize spikes.
- **Verify good positioning.** Small position errors can cause erroneous patch test results. If your HDOP is high, consider calibrating at another time.
- **Take care to stay on line.** PATCH TEST only works on overlapping data.
- **Parallel lines require 50% (1/2 swath) overlap** where the data from each swath will be compared.
- **Test in the deepest section of your survey area**. Errors are most apparent and more accurately calculated in deeper waters.
- **Always collect three sets of data** to confirm the results.
- **Average the results** from multiple patch tests for final results.

PATCH TEST INTERFACE

The PATCH TEST interface is a 4-tabbed dialog, one tab for each offset you will test.

FIGURE 2-12. *PATCH TEST Interface*



In each tabshows the alignment of the data in your two overlapping data sets(red soundings from the first file and green from the second), default angle and step settings and the matrix cell size.

When the calculations are complete, a graph of the difference between the cross sections(Y-axis) for each angle or time adjustment (X-axis). You are looking for a distinct V-shaped graph where the best offset adjustment valueis at the apex of the ‘V’. This value is displayed in the ‘Adjustment’ field and added to the original offset value to calculate the final offset value that you should then enter as your sounder offset in HYSWEEP® HARDWARE. You can view cross sections of your soundings and the results of the calculations in the graphs in the lower part of the window

CALCULATING OFFSET ADJUSTMENTS WITH PATCH TEST

Since the calibration of one offset will affect the results of subsequent tests, you should process each pair of lines separately and in the following order:

1. **Latency:** Delay between the position fix and the data arrival time introduces positioning error, independent of any transducer misalignment.
2. **Pitch:** Vertical misalignment, forward and aft, between sonar and MRU can cause depth and position errors across the swath.
3. **Roll:** Vertical misalignment, port and starboard, between sonar and MRU can cause depth errors, especially at the outer beams.
4. **Yaw:** Misalignment of the sonar and gyro relative to the boat frame can cause position errors.

NOTE: If you save the results of one test and load the next pair of lines into the HYSWEEP® EDITOR, the program will ask if you want to apply the offsets calculated thus far. Since one offset affects the accuracy of later calculations, this is usually a good thing to do.

FIGURE 2-13. *Latency*

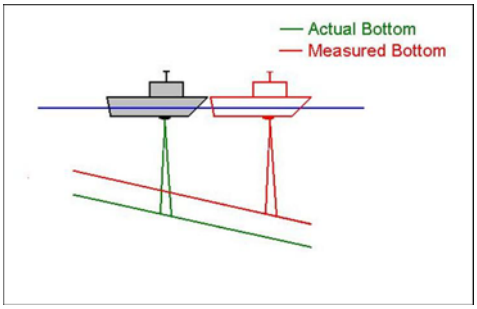


FIGURE 2-14. *Pitch*

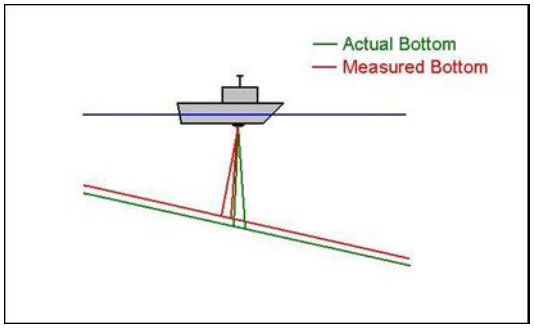


FIGURE 2-15. *Roll*

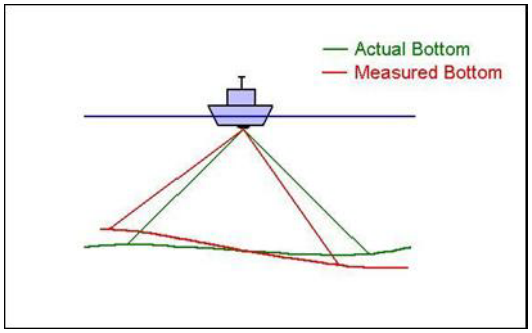
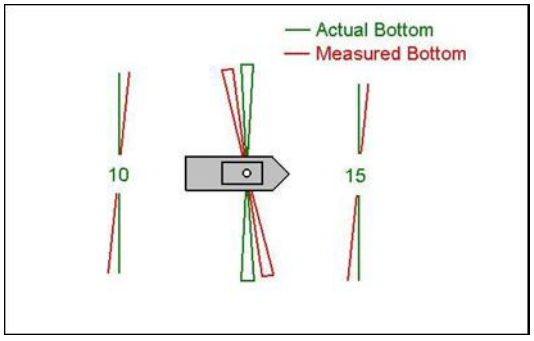


FIGURE 2-16. *Yaw*



1. **Run one pair of test lines (latency, pitch, roll or yaw) through the HYSWEEP® EDITOR** to phase 3.

TIP: After you run each test and progress to the next, apply the previously calculated adjustments to the subsequent tests. (The program will ask; just say yes!)

TIP: As you go to phase 3, the Matrix Options dialog enables you to select the matrix and set the cell dimensions. *We recommend that you select the Auto-Size to Data, Rotate to Survey Line and Auto Cell Size options.* These options attempt to optimize the matrix configuration based on your data and equipment.

2. In phase 3 of the HYSWEEP® EDITOR, **start PATCH TEST**. The Patch Test is a 4-tabbed dialog—one tab for each offset tested.

   - **Manually choose the cross section on which to base the statistics**. *This method is recommended* as it enables you to cut the profile at optimal positions in your data for each test.

     Click the wrench icon in the Survey window then drag the cursor across the data in the Survey window. The Patch Test will appear displaying the selected data and a "Manual Cross Section" label.
   - **If you want the HYSWEEP® EDITOR to choose the cross section** on which to base the statistics, select TOOLS-PATCH TEST. The Patch Test will appear displaying the selected data and an "Automatic Cross Section" label. In this case, the cross sections will be positioned as follows:
     - **Latency and Pitch:** Directly under the trackline.
     - **Roll:** Transverse to the survey lines at their mid-point.
     - **Yaw:** Mid-way between the tracklines.
3. **Select the tab that corresponds to the sounding lines you selected**. (If you selected the data to test roll, select the roll tab.)
4. **If you are using a system with two sonar heads, tell the HYSWEEP® EDITOR whether to use data from head 1, head 2 or both**. (Select Head 1 if your echosounder has only one head.) This option is useful where two sonar heads are mounted in different places on the survey vessel.
5. **Set Angle/Time Step and Number of Steps.** In each tab, [Coarse Steps], [Medium Steps] and [Fine Steps] provide suggested Angle/Time Step settings, but you may enter other values if you wish.
   - **Angle/Time Step** is the increment for each step. (Refer to the following table for suggested settings for each test.)
   - **Number of Steps** is the number of calculations either side of the original latency time. You should increase this value each time you decrease the Angle/Time Step.

TABLE 2-3. *Suggested Angle/Time Step Settings for Each Test*

Test	Angle/Time Step
Latency	Time Step = 0.1 sec for DGPS. 0.05 with RTK GPS
Pitch	Angle Step = 1 degree for DGPS. Better with RTK GPS

Test	Angle/Time Step
Roll	Angle Step = 0.1 degree
Yaw	Angle Step = 1 degree for DGPS. Better with RTK GPS

6. **Click [Start Test].** The HYSWEEP® EDITOR will do the calculations to determine if any offset adjustments are necessary.
7. **Save test results** (optional). The [Save Test Results] button saves a screen capture of the current PATCH TEST tab to an RTF file[1] and to a running history of the session's PATCH TEST results. When you save your first result, the program will ask you to name the RTF file. All subsequent saves performed during the current HYSWEEP® EDITOR session are automatically saved to the same file.
8. **View history** (optional).
   - **[View History]** opens a tabbed dialog with one tab per test. Each tab displays a spreadsheet with one record for each saved test of that type. Each record includes the survey time and date information from the header of your survey data and the final offset calculated by the test.

     To save a screenshot of this display to your RTF file, click [Save to RTF].
   - **Open your RTF file** to view the results of each screenshot saved from PATCH TEST.

When the calculations are complete, a graph of the difference between the cross sections(Y-axis) for each angle or time adjustment (X-axis). You are looking for a distinct V-shaped graph where the best offset adjustment valueis at the apex of the 'V'. This value is displayed in the 'Adjustment' field and added to the original offset value to calculate the final offset value that you should then enter as your sounder offset in HYSWEEP® HARDWARE. You can view cross sections of your soundings and the results of the calculations in the graphs in the lower part of the window

1. **RTF (Rich Text Format) files** are text documents that support graphics. If your current word processor does not support graphics, you can download the Word Viewer from Microsoft free of charge.

FIGURE 2-17. *The HYSWEEP® EDITOR GPS Latency Test*

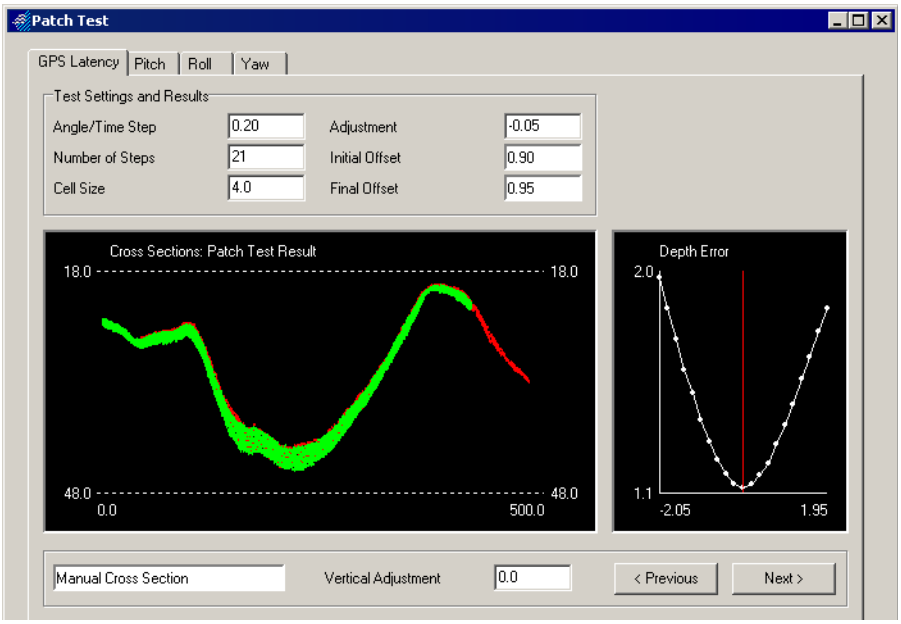


FIGURE 2-18. *The HYSWEEP® EDITOR Pitch Test*

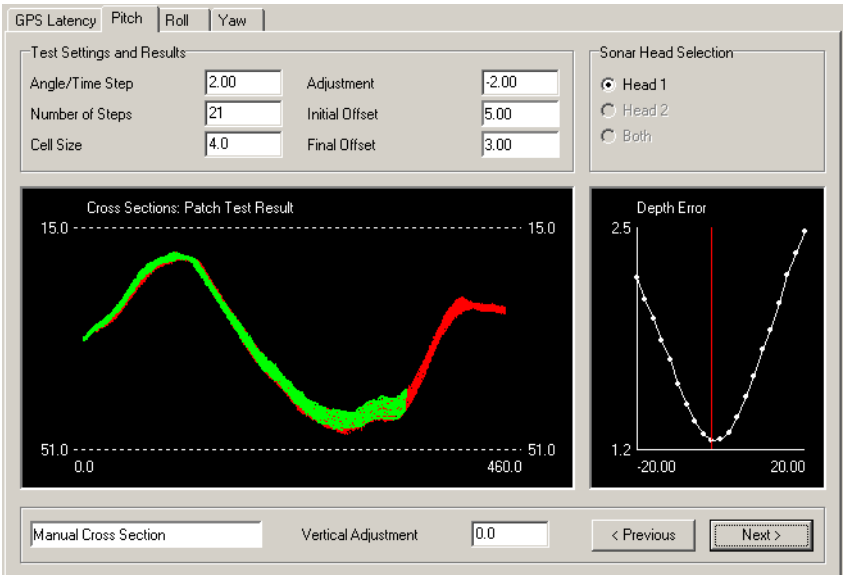


FIGURE 2-19. *The HYSWEEP® EDITOR Roll Test*

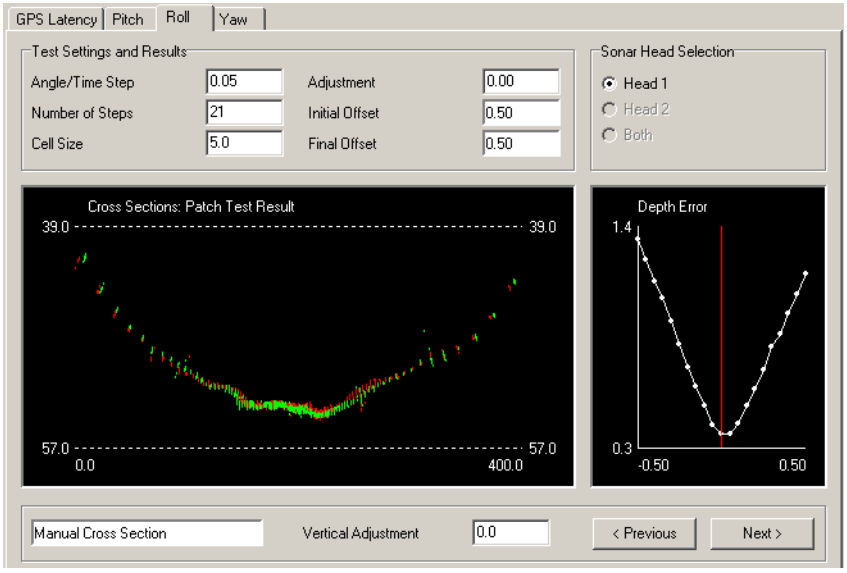
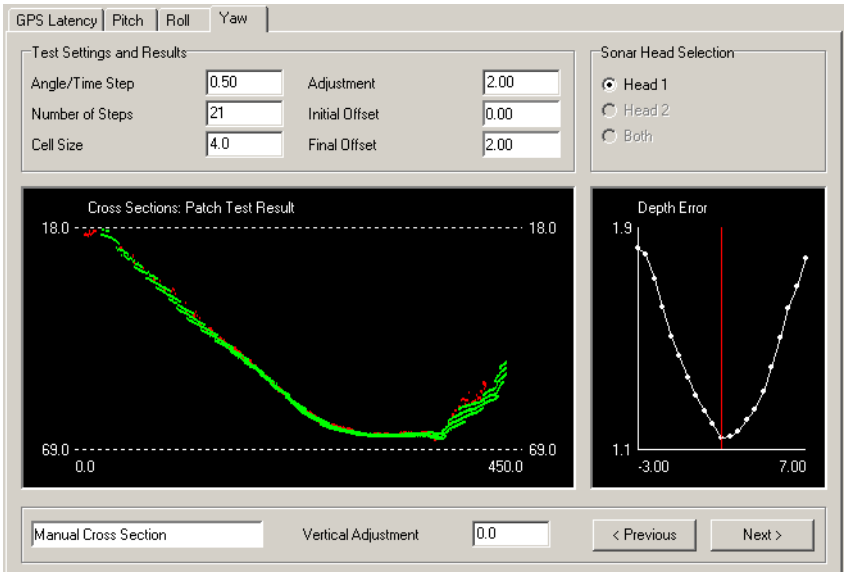


FIGURE 2-20. *The HYSWEEP® EDITOR Yaw Test*



FINALIZING HARDWARE OFFSETS USING CALIBRATION TEST RESULTS

Calibration tests calculate adjustments that must be made in your hardware offset settings to collect accurate depth and position data. The values calculated in the LATENCY TEST or PATCH TEST should be used as follows for maximal accuracy of your hardware offsets.

In the HARDWARE program:

1. **Click on the DEVICE menu and select your position device**.
2. **Click [Offsets] and enter your latency** in seconds.
   - **Single beam configurations:** Subtract the value calculated in the LATENCY TEST program from the current latency value.
   - **Multibeam configurations:** The latency value calculated by the PATCH TEST should be entered into the hardware setup for your GPS to correct timing errors in the system.
3. **Click [OK] to exit OFFSETS, and [OK] again to exit the DEVICE SETUP**.

For multibeam configurations, enter all of the final offset values calculated by the PATCH TEST in HYSWEEP® HARDWARE.

In the HYSWEEP® HARDWARE program:

Enter the *Final Offsets* value from the PATCH TEST dialogs to the device offsets in the HYSWEEP® HARDWARE program. Select "Hypack Navigation" to apply the latency and the echosounder to apply the roll, pitch and yaw values.

NOTE: For devices that are loaded through HYPACK® HARDWARE, but feed information to HYSWEEP® SURVEY, change the offsets in HYPACK® HARDWARE *and* in HYSWEEP® HARDWARE.

For example, for a GPS:

- In HYPACK® HARDWARE, select the GPS and adjust the Offsets dialog.
- In HYSWEEP® HARDWARE, select HYPACK® SURVEY and adjust the antenna offsets in the Offsets tab.

FIGURE 2-21. *Adjusting Hardware Offsets in* ***HYPACK® HARDWARE***

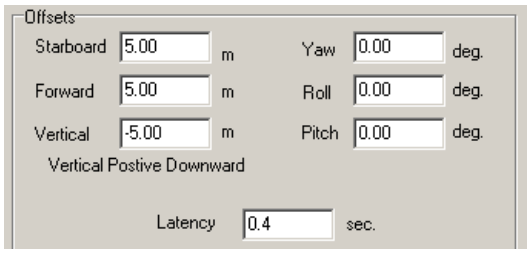
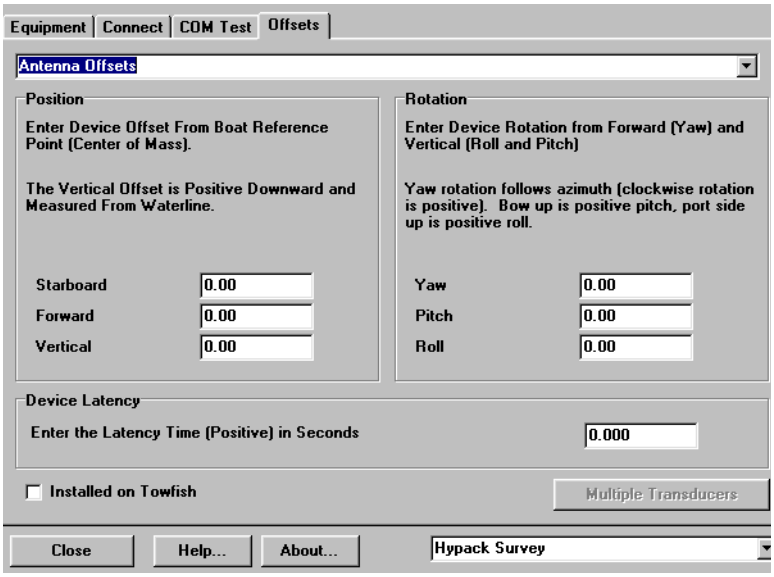


FIGURE 2-22. *Adjusting Hardware Offsets in HYSWEEP® HARDWARE*



CORRECTING OFFSET AND LATENCY ERRORS IN SURVEY DATA

If you run your calibration test before the survey, and the calculated adjustments made in the hardware setup, data should not have to be adjusted. We all know, however, that things happen and we may need to adjust survey data. When it is required, existing data files are fixed in the editing program.

If you have already collected survey data with incorrect offsets, the LATENCY TEST or PATCH TEST values can be used to adjust data files as they are read into the editor program.

When the editor reads your raw data, the Read Parameters dialog displays the offsets for each device as they were set in your hardware configuration during SURVEY. (Select the Offsets tab in the SINGLE BEAM EDITOR , or the Device Information tab in the HYSWEEP® EDITOR.).

The dialog displays settings for each device in your project. Select the device of interest from the drop-down box and enter the correct offsets (as they should have been during SURVEY). These offsets will be applied to all currently selected files in place of those in your hardware configuration during Survey.

NOTE: Editing the offsets in this manner will affect only the edited data. *It will not affect raw data.*

FIGURE 2-23. *Offsets Tab in the Single Beam Editors*

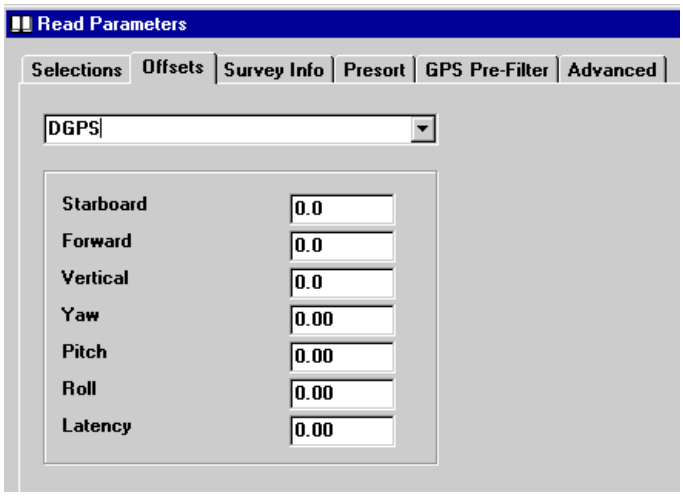
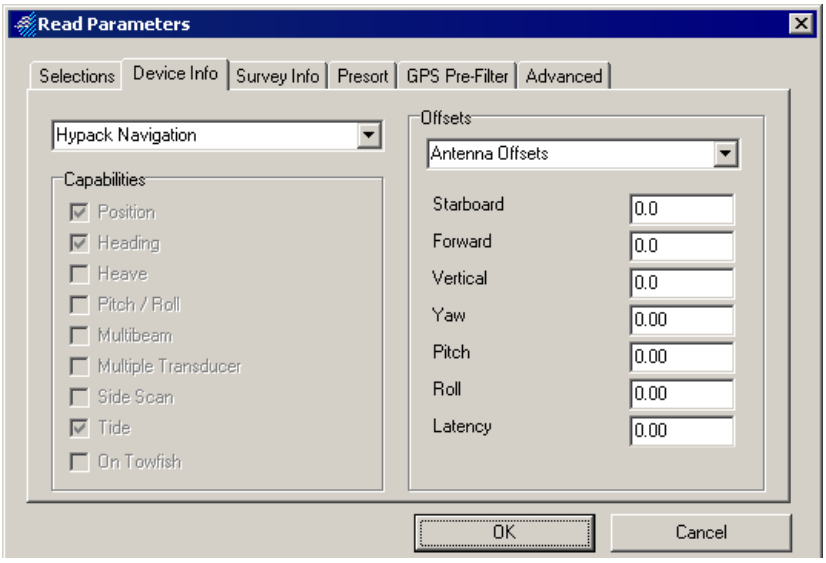


FIGURE 2-24. *Device Information in the HYSWEEP® EDITOR*



HARDWARE NOTES

Each type of device comes with its own set of setup considerations. For each sensor, the setup includes:

- Device functions
- Driver Setup
- Offsets
- Connection
- Mobile Assignment
- Advanced Options

GPS POSITIONING EQUIPMENT

GPS stands for the Global Positioning System. This is a system of 24 satellites, which provides accurate positioning services twenty-four hours per day. GPS equipment can “trilaterate” a position for the GPS antenna using the distances between four or more satellites, and the exact position of each satellite at the time of measurement. The accuracy of the position depends on several factors, the most important being the mode of positioning.

More Information

- “Pos-MV Network Connections in HYPACK® and HYSWEEP®” on page 2-210

GPS POSITIONING MODES

Your GPS can be operated in different modes. The mode determines the accuracy of the output.

TABLE 2-1. *GPS - Modes and Accuracy*

Mode	Accuracy (Approximate)
Stand Alone (No Differential)	5m-10m
Differential	1m-5m
Real Time Kinematic	5cm-10cm

- **Stand Alone** is GPS at its most basic. All you need is a GPS receiver on his boat. Since the general public was given use of the "P-Code" (previously only available to the U.S. Department of Defense), you can resolve a position to within 10m. Stand-alone GPS should only be used in hydrographic surveying if the errors represent less than 0.1mm on your plotting sheet. For example, if you are surveying at

1:100,000 a GPS positioning error of 100m would represent 0.1mm on your plotting sheet.

- **Differential mode** (DGPS) uses error corrections, generated by a shore-based station over a known point to improve accuracy to less than 5 meters. By placing a GPS unit on a known point, the receiver can compare what the observed distances are to what the calculated distances are for each satellite. The difference between these two distances can be attributed to atmospheric conditions, dithering, spoofing or pseudo-range ambiguities. (Ha! That's a good one! Confuse them with tech-talk.) The shore-based GPS unit can calculate corrections for each satellite and transmit them to the ship-based GPS unit via a radio telemetry link. These corrections are called RTCM. The ship-based unit then "corrects" the observed distances from each satellite and computes an improved position. The U.S. Government, and many other nations, have now established government –run differential beacons that provide differential correction service anywhere on the nation's waterways. By purchase of a GPS-Beacon system, you do not have to establish your own shore station. The GPS-Beacon system automatically determines the best (or closest) station to use. Accuracy for GPS systems depends on the quality of the set, the number of satellites being tracked and the geometry of the satellites being tracked.
- **Real Time Kinematic** (RTK) uses more information to determine the exact wavelength count between each satellite. By using an RTK-capable base station with an RTK-capable ship station, you can position the GPS antenna to within 5 to 10 cm. The main drawback to RTK systems is that you must invest in and maintain their own base station. The base station must also be within several kilometers (say, 10km for argument's sake) of the ship and a "high end" radio telemetry link must be used to transfer higher data rates than normal GPS traffic.

  Using the precise positioning capability of RTK, it is possible to use the GPS antenna to determine water level readings. This allows you to work without having to use traditional tidal corrections.

More Information

- “Real Time Kinematic (RTK) Tide Corrections” on page 8-14

GPS Positions

A GPS system provides constant updates from the ship's GPS antenna. This information is normally given as **Latitude, Longitude** and **Ellipsoid Height**, and is based upon WGS-84. There are a few systems that can be programmed to provide Latitude, Longitude and Ellipsoid Height on another datum. There are also a few GPS systems which can be programmed to provide X-Y coordinate information on a user specified projection.

- **If your GPS provides WGS-84 based information and you are surveying on a datum other than WGS-84** (or other than GRS-80 [NAD-83]), you need to tell the SURVEY program it has to perform a datum transformation.
- **If your GPS provides a position based on the datum on which you are surveying**, whether it is WGS-84 or any other ellipsoid, you do not need to perform a datum transformation. All of the Datum Transformation parameters should be set to zero.
- **If your GPS provides an X-Y coordinate on your projection**, all you have to do is select the correct device driver to read this information. If a device does not exist, you can use the Generic XY driver and specify where in the data string the X-Y information is provided.

Beware!

BEWARE! Some GPS systems that provide latitude/longitude/ellipsoid height on datums other than WGS-84. Most of these systems are performing a datum transformation based on regression models. Depending on the number of points in your area that were used to create the model (something you won't know), the accuracy of the calculations may vary. The only way to test it is to take your GPS system over a known point in your area and monitor the position for a couple of hours.

There are also GPS systems that provide you elevation in Mean Sea Level. These systems also use a regression model to translate from Ellipsoid Height to Mean Sea Level. In the documentation of some GPS equipment, they say Mean Sea Level, when they should be saying Ellipsoid Height.

More Information

- "Entering Datum Transformations Parameters" on page 2-51
- "Datum Transformations" on page 10-79

GPS MESSAGES

Most GPS systems can be configured to output NMEA messages. NMEA is a standard that defines how information is to be exchanged by different types of equipment. Although many manufacturers have "bent" the standard, most NMEA devices can communicate with HYPACK® by using the GPS driver using the following messages:

Position:	
GGA	Position/Status Information
GLL	Position Information (Lat/Long/Time only)
GGK	Early Kinematic Message
PNTL,GGK	Kinematic and quality information.
GNS	Position and Status Information

Heading:	
VTG	Velocity & Heading
HDT	True Heading Information
RMC	Speed and Heading Information
GST	Heading Information

Miscellaneous:	
PTNL,QA	Quality message for the PTNL,GGA
PTNLR,ATT	Attitude Information
PSER,ATT	

For all GPS applications, we prefer to receive the GGA and the VTG messages. They should be selected in the Advanced window of the GPS Driver Setup dialog.

The GGA message provides:

- UTC Time Information
- Latitude
- Longitude
- Ellipsoid Height
- PDOP\Number of Satellites
- GPS Mode (Differential vs. Stand-alone vs. Kinematic)

Some lower end equipment outputs the GLL message, instead of the GGA. This provides only the UTC time, latitude and longitude information. The main drawback is that this equipment does not notify the SURVEY program when the mode changes from Differential to Non-Differential.

The VTG sentence provides:

- Speed Information
- Course Made Good Information

TIME TAGGING OF GPS INFORMATION

To correctly correlate depths with positions, it is essential to determine the precise time of the GPS measurement. The following table presents the three techniques used in HYPACK® to determine the time of

measurement in order of accuracy. Each has its advantages and drawbacks

Method	Advantages	Disadvantages
Monitor the 1PPS Output of the GPS	• Provides a time tag of 1PPS times accurate in HYPACK® to within 100 microsecs. with standard deviation of 2 microsecs.	• Requires a special hardware box and cable. • GPS manufacturers differ over the timing of the 1PPS pulse.
Use the NMEA ZDA message to synchronize the computer clock.	• Simple. It does not require any special box or cable. • Eliminates drift between the GPS and computer time. • Accuracy to within 1 msec. 98% of the time.	• The $ of the $GPZDA message must be transmitted at the referenced UTC time. • Some GPS units do not have ZDA capability.
Apply a Fixed Latency Time.	• Simple. It does not require any special cable and allows you to operate on local time.	• GPS latency can vary, depending on the type of receiver, the number of satellites and the geometry of the satellites.

Time Tagging Using the 1PPS Pulse

If you include data from another computer with time synchronized data (such as the POS MV or Geoswath), your survey computer must also be synchronized in order to accurately match the data. In HYPACK®, we synchronize to UTC time.

Many GPS units can output a 1PPS (pulse per second) signal that is synchronized with the measurement phase. By using a 1PPS box to synchronize the computer clock to UTC time indicated in the ZDA message, HYPACK® can achieve time tag precision to within 100 microseconds of the 1PPS pulse (the most accurate indicator of the UTC time) with a standard deviation of 2 microseconds.

The HYPACK SURVEY program uses the 1PPS box to monitor the CTS line of the GPS serial port. Every time it changes state (from 0 VDC or from 5 VDC to 0 VDC), it takes a time tag from the computer clock. If a latency value has been entered, it also offsets the time-tag by the value in the latency offset. The next message arriving from the GPS then receives that time tag.

In HYPACK HARDWARE, check the ‘Synchronize computer clock with GPS clock’ option in the System settings, and the ‘Use PPS box for timing’ option in the general tab of the GPS driver setup.

FIGURE 2-1. *Check the Sync. Computer Clock with GPS clock Option*

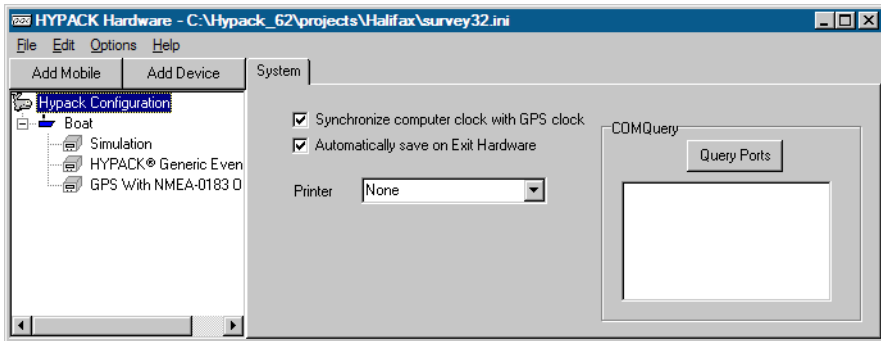
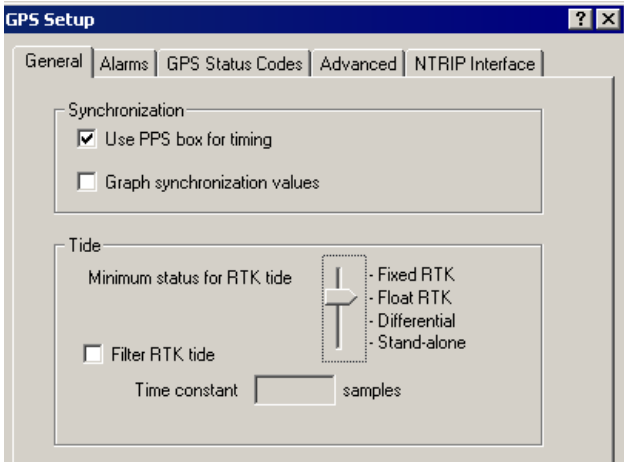


FIGURE 2-2. *Instructing the SURVEY Program to use the 1PPS output for time tagging in the GPS.dll setup.*



You can use the ZDA TEST to verify the synchronization and view statistics regarding various factors affecting the level of synchronization.

More Information

- "Confirming Time Synchronization with the ZDA TEST" on page 2-197

Time Tagging GPS Information Using the NMEA ZDA Message

Using the arrival time of the ZDA message, HYPACK® eliminates clock drift between the GPS and the computer clock and generates time tags to within 1 millisecond accuracy 98% of the time.

This is only important when using devices that output time-tagged information. In these cases, the device must also be synchronized to the ZDA time and we maintain the time the device assigned to the data because it is more closely correlated to the data than if we were to assign a time-tag when the survey computer receives the data.

NOTE This works for all GPS devices, whether they are RTK-capable or Differential.

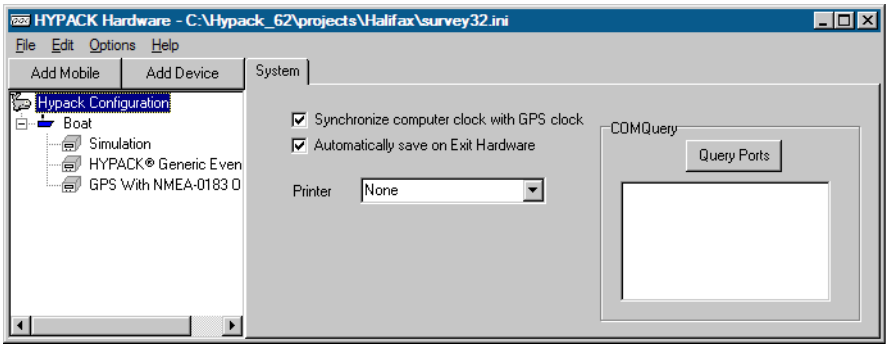
Many GPS units can output a ZDA message, which contains only the UTC time, at the UTC time tic. As soon as the message is received the SURVEY program uses the local time offset from the Windows® registry and resets the computer clock to the local time. All of the time tagging for other devices (echosounder, gyro, etc.) will now be based on the computer clock, which is based on the local time. You should let SURVEY run for at least a minute to begin the process. From then on, the SURVEY program uses the UTC time contained in the GGA message as the time tag for the GPS position.

Beware!

BEWARE! Update rates for ZDA messages, *set in the GPS*, should be no faster than 1000 msec (or 1 Hz) when you are using the Sync. Clock feature. Faster update rates may result in significant drift between the computer clock and GPS time.

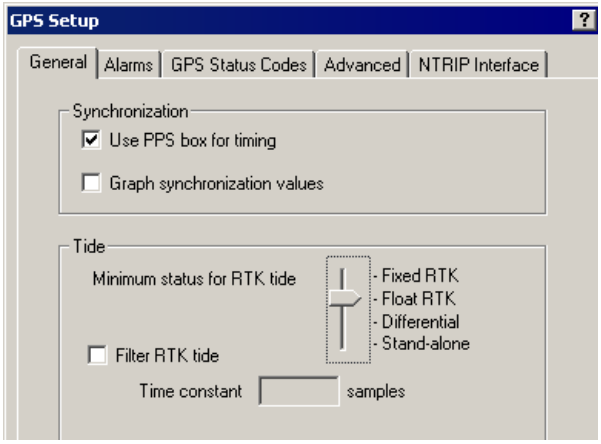
1. **Check the 'Sync. computer clock with GPS clock' option** in the Device Setup dialog .

FIGURE 2-3. *Check the Sync. Computer Clock with GPS clock Option*



2. **Clear the 1PPS and 'Sync clock on other sentences than ZDA' options** in the GPS Driver Setup.

FIGURE 2-4. *Clear 'Sync. Clock on other sentences than ZDA'--GPS.dll*



To monitor your system for time synchronization failure, display the graph of the synchronization values. These options are defined in the GPS driver setup dialogs.

More Information

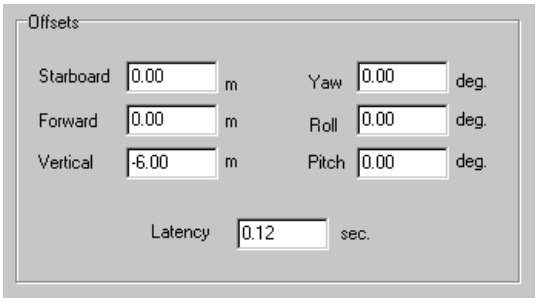
- "Confirming Time Synchronization with the ZDA TEST" on page 2-197

Applying a Fixed Latency Time

Enter a latency value in the Offsets dialog for the GPS device. When a measurement is received from the GPS, the computer takes the current computer clock time. It then subtracts the latency value to determine the time of the measurement.

For example, if the latency is 0.5 seconds. When the computer receives a GPS message, it gets a time tag when it receives the first character. It would then subtract the 0.5 seconds from the time tag to obtain the final time of measurement.

FIGURE 2-5. *Specifying the Latency for a GPS device*



To obtain a latency value, perform a single beam latency test or, if you also have a multibeam system, a patch test. This determines the combined latency between the GPS and your echosounder.

Beware!

BEWARE! There is some variation in GPS latency. For most newer equipment, we have performed tests that show the standard deviation of latency to be within 0.050 seconds for most GPS receivers. The main problem occurs with RTK units. There are some RTK units that take up to two seconds to output a position. These sets have major variation in latency and this method should be used at survey scales of 1:25,000 or higher.

More Information

- "Confirming Time Synchronization with the ZDA TEST" on page 2-197
- "Calibrating your Hardware" on page 2-168

Confirming Time Synchronization with the ZDA TEST

The ZDA TEST monitors your GPS input and provides detailed feedback allowing you to adjust your system settings to optimize proper function.

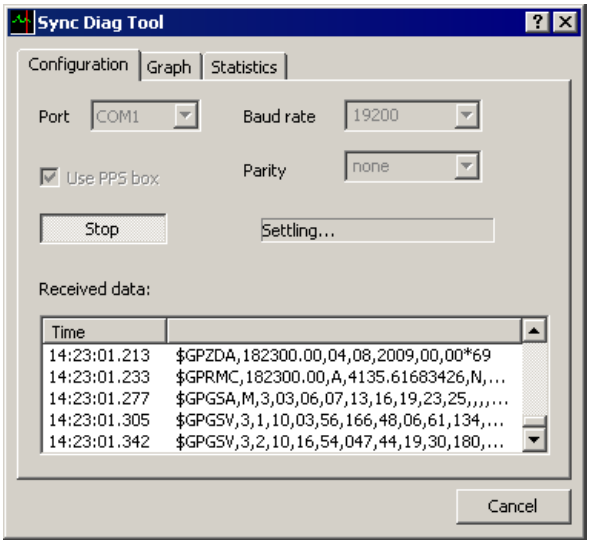
The program checks for the following conditions:

- **ZDA messages are arriving from the GPS once per second.** Anything between 0.8 sec and 1.2 sec is considered good.
- **Number of characters is consistent with baud rate.** If the number of characters received in one second is more than 80% of the maximum number that could be received, shows the following message:"Too many characters received in one second. Increase the baud rate or reduce the number of NMEA messages."
- **Checks if the PPS pulse are correctly received** if configured for PPS pulses.

To run the test, do the following:

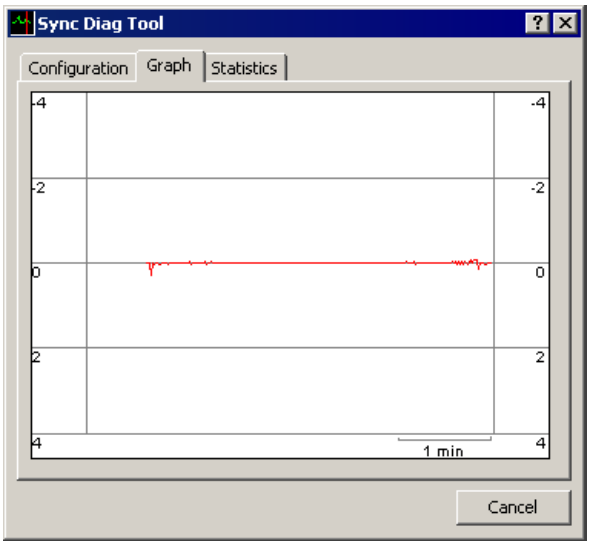
1. **Launch the ZDA TEST** by selecting UTILITIES-CALIBRATION-ZDA TEST. A tabbed dialog will appear.
2. **In the Configuration tab, enter your connection settings and click [Start]**.
   - The Configuration tab displays the data received from the GPS.

FIGURE 2-6. *Configuing your Connection Settings in the ZDA TEST*



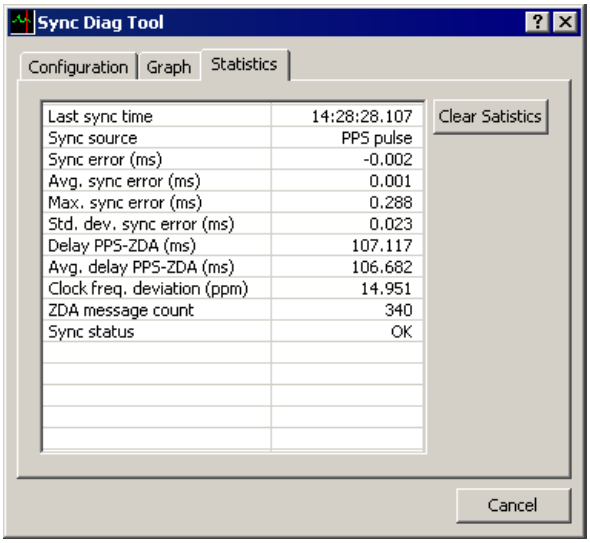
- The **Graph tab** displays a scrolling graph of the synchronization error.

FIGURE 2-7. *Sample ZDA TEST Graph*



- The **Statistics tab** shows a table of numerical data related to the synchronization.

FIGURE 2-8. *Sample ZDA TEST Statistics*



NMEA Records in RAW Data Files

The SURVEY program can store the following record types for NMEA GPS equipment in the SURVEY programs.

TABLE 2-2. *Raw Format*

Message (Tag) Type	Information
POS (Position data)	Device number Time tag Easting Northing
RAW (Raw data)	Device number Time tag WGS-84 latitude WGS-84 longitude WGS-84 ellipsoid height
QUA (Quality data)	Device number Time tag PDOP/HDOP Number of satellites Quality information (if available).
CAP (Single Beam) RMB (Multibeam) RSS (SideScan)	Data string as it is read from the device.

The **POS, RAW and QUA** records are automatically recorded at the specified logging rate.

This provides flexibility should the need to re-compute positions arise, due to a different projection or ellipsoid or transformation, after the data has been collected.

GPS Settings

We recommend using the GPS device driver for your GPS device. These drivers include the HYPACK® Veritime time-tagging, accurate to within 1 millisecond and eliminates computer clock drift. The time- tagging routine obtains accuracy to within 100 microseconds. The GPS device drivers can time-tag data from either RTK or Differential GPS devices.

GPS.dll can also calculate real-time tide corrections using data from RTK GPS devices. If you are using a DGPS, apply tide corrections from a tide gauge or in post-processing using tide correction files.

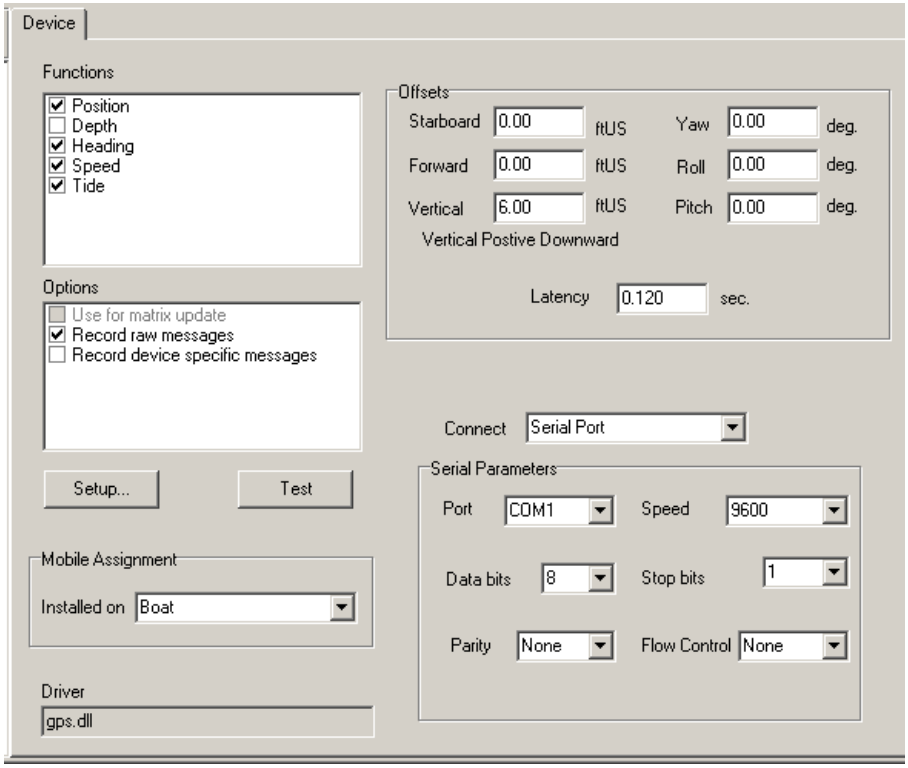
More Information

- "Synchronizing your Computer to the POS MV Time" on page 2-211
- "Telemetry Tide Gauges" on page 2-229
- "Tide (Water Level) Corrections" on page 8-1

GPS Driver Setup Window

In the HARDWARE routine's Device Setup dialog, you can access the driver setup by clicking on [Setup].

FIGURE 2-9. *GPS.dll - Device Setup dialog*



Position stores position data from this device.

Depth is typically unused by GPS devices. However, it is used in conjunction with the 'Record Tide as Depth' option to, for example, record waterfront depths recorded using land vehicles.

Heading tells the SURVEY program to use the Course Made Good from the VTG, RMC or HDT message for the orientation of the vessel.

Beware!

BEWARE! If you are using a gyro for heading, you should *not* select heading for your GPS. If both were selected for heading, the SURVEY program would switch between gyro and GPS orientation as each device updates and you would see the vessel in your SURVEY Map window twitch at each update. This is because it is unlikely that the two heading values will be *exactly* the same.

The **Speed** box tells the SURVEY program to use the speed information from the VTG message for the vessel speed. The GPS speed is much smoother and more accurate than the speed the SURVEY program will calculate. We recommend that you use the speed from your GPS antenna.

The **Tide** box is available for RTK GPS devices only when using the GPS device driver. If you check this box, the program will create real-time water level corrections at each GPS position update, based on the separation between the ellipsoid height and chart datum and the separation between the GPS antenna and the echosounder transducer.

TIP: If you are using a DGPS, we recommend that you use a tide gauge or create tide correction files to account for changing water levels.

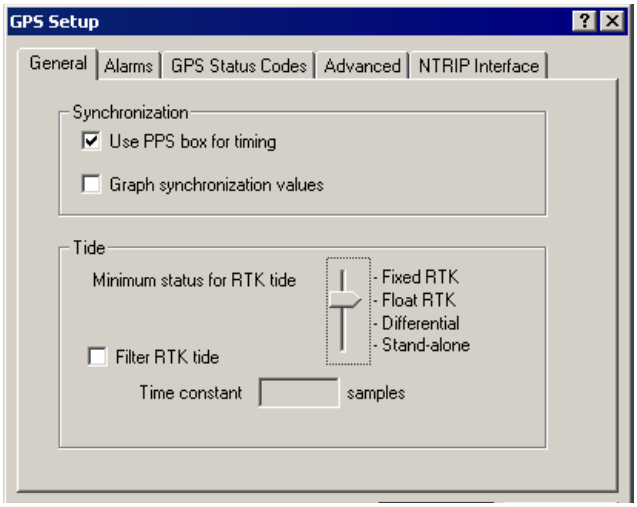
More Information

- "Hardware Setup in HYPACK®" on page 2-120

General GPS Setup Options

To access the Driver Setup dialog, click on [Setup] in the Device Setup dialog.

FIGURE 2-10. *GPS.dll Setup - General Tab*



Use PPS box for timing improves the time-tagging to within 100 microseconds**.** This requires a special interface device available through HYPACK, Inc., and ZDA output from your GPS. You must also check the 'Sync Clock' option in the vessel's System dialog. If you are not using a PPS box, the computer time will be used.

Graph synchronization values: When checked the graph in the right hand side shows the following synchronization values:

- **Phase difference** in msec (red) is the instantaneous difference between the GPS time and Veritime time. For instance if the GPS clock is 15:32:41 and Veritime time is 15:32:42.5 the phase difference is 0.5 sec.

- **Filtered error signal** in msec (blue) - The frequency adjustment factor indicates if the computer clock is too fast or too slow compared with the GPS clock. For example, if the factor is 1 that means that computer clock would remain behind the GPS clock 1 millisecond for every second.
- **Frequency adjustment factor** in msec/sec (green) - The filtered error signal corrects the Veritime clock if it is too fast or too slow. When it is 0 the two clocks have the same frequency (the system has found the correct value for the frequency adjustment factor).

Minimum status for RTK Tide: Set the slider for the minimum GPS status at which your RTK GPS will calculate tide corrections.

Filter RTK Tide compares the previous and current tide values and uses the **Filtered Time Constant** to adjust the newest tide value. These adjustments smooth out small boat movements caused by factors such as choppy waters.

You may need to experiment with this a bit to find the settings that you prefer. Three factors affect the smoothing.

- The **Signal Frequency**: The high frequency signals are affected more than the low frequency signals.

FIGURE 2-11. *Low Frequency Signals-- 0.85 Filter Constant.*

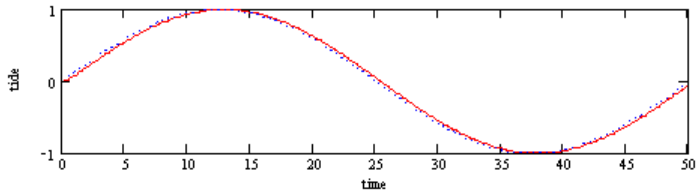
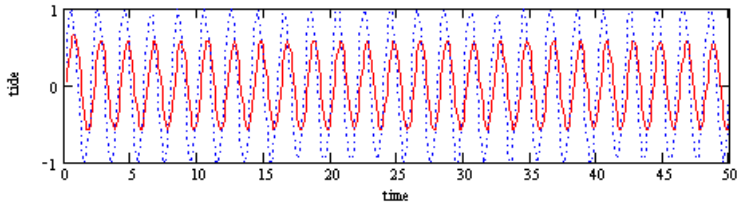
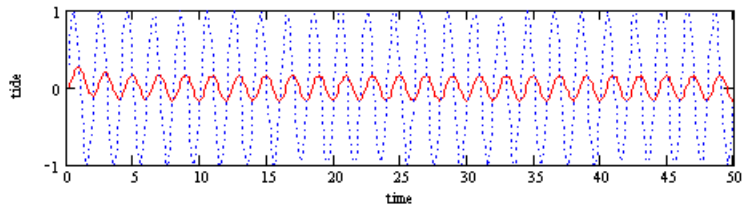


FIGURE 2-12. *High Frequency Signals-- 0.85 Filter Constant.*



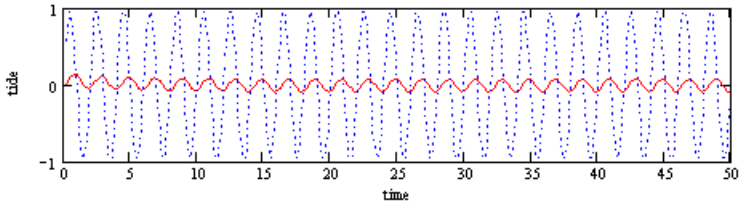
- The **Filter Time Constant** determines how much to weight (percentage) the previous tide value in your comparison. The higher the constant, the more output signal is attenuated.

FIGURE 2-13. High Frequency Signals -- 0.95 Filter Constant.



- The **Measuring Rate of the GPS**: The fewer signals per unit of time, the more effect the filter will have.

FIGURE 2-14. High Frequency Signals -- 0.95 Filter Constant—Low Measuring Rate



This filtering process gives you a nice display during SURVEY but the 'Average Tide Data to Remove Heave' option, in the single beam and multibeam editing programs, is technically a better tool to use to smooth your data.

TIP: We recommend that if you are editing using one of the HYPACK® editors, smooth your tide data using the "Average Tide Data to Remove Heave" option in the editor program. If you are exporting your raw data to be edited by another system, you may want to use this filter.

More Information

- "Time Tagging of GPS Information" on page 2-193
- "Confirming Time Synchronization with the ZDA TEST" on page 2-197

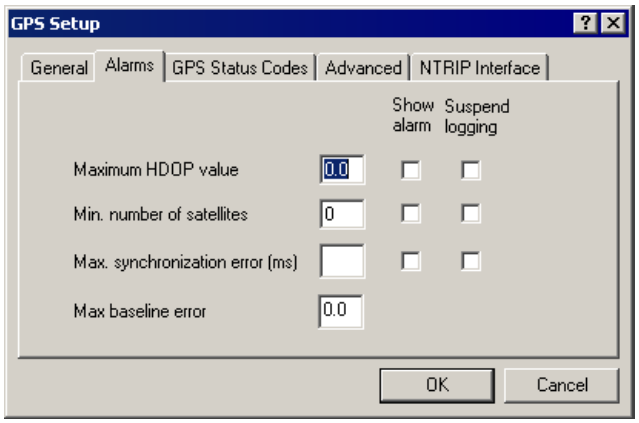
CONFIGURING GPS STATUS CODES AND ALARMS

The **Alarms** and **GPS Status Codes** tabs provide settings to show alarms or suspend logging (or both) based on the quality information in the GGA string.

NOTE: You can also filter single beam and multibeam data based on these codes in the SINGLE BEAM EDITOR and HYSWEEP® EDITOR programs respectively.

Alarms Tab

FIGURE 2-15. *GPS Driver Setup - Alarms Tab*



In the Alarms Tab:

1. **Enter alarm conditions**.
2. **Check the corresponding Show Alarm box for each condition to which you want to be alerted**.

TABLE 2-3. *Alarm Conditions*

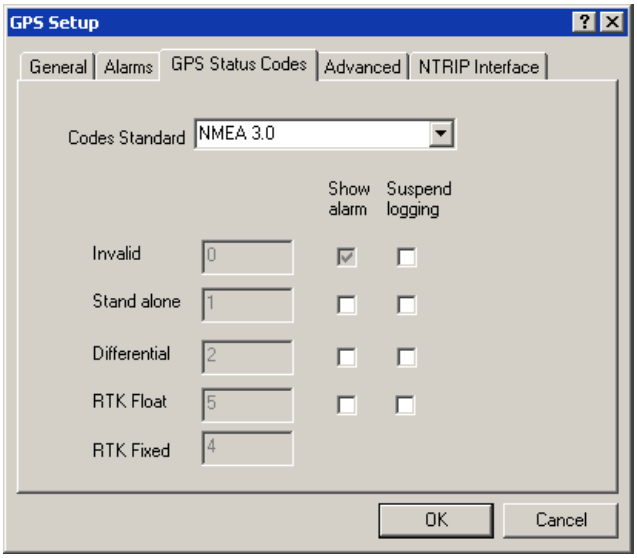
Alarm Condition	Alarm Shown When
Maximum HDOP	HDOP greater than the value entered.
Number of Satellites	Number of satellites less than the value entered.
Maximum Synchronization Error	Difference between the computer time and GPS time at any sync. attempt is greater than the value entered.
Maximum Baseline Error	Distance between GPSs configure for OTFGyro is greater than the distance entered.

3. **Check Suspend Logging to suspend (and resume) logging tide and depth data under the same conditions**.

Max baseline error shows an alarm button if the distance between the GPS devices is calculated to be greater than the user-specified distance.

GPS Status Codes

FIGURE 2-16. *GPS Driver - GPS Status Codes Tab*



In the GPS Status Codes Tab:

1. **Select a GPS Status Code** according to your GPS output.
   - If you select either the NMEA 2.1 or NMEA 3.0 option, the status fields will automatically reflect the correct values.

TABLE 2-4. *GPS Status Codes*

GPS Mode	NMEA 2.1	NMEA 3.0
Invalid	0	0
Stand Alone	1	1
Differential	2	2
RTK Float	3	5
RTK Fixed	3	4

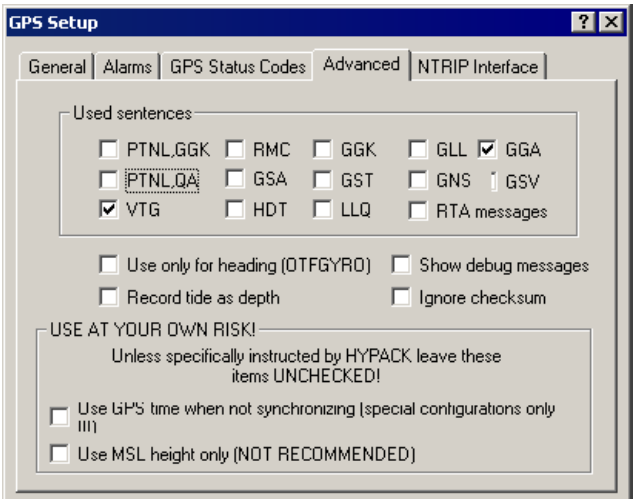
   - If your GPS does not conform to either of these standards, select the Custom option and define your own status codes.
2. **Check the corresponding Show Alarm box for each condition to which you want to be alerted**. Alarms will show when the status codes equal the selected status. A typical RTK configuration might be to show an alarm for invalid, differential and invalid to indicate that you have lost RTK status.
3. **Check Suspend logging to suspend (and resume) logging tide and depth data under the same conditions**.

Beware!

BEWARE! If you are using a DGPS, *do not select the RTK alarm options!* It will result in a constant alarm, and even worse if you were to suspend logging too, you will get no data!

GPS Advanced Setup Options

FIGURE 2-17. *GPS Advanced Options*



Used sentences: Instructs which strings the driver should read from your GPS output. You should select at least one string for each function selected in the Device Setup (Position, Heading, Speed, etc). A table of messages and a general description is found under 'GPS Settings'.

Note: Select only one positioning string. In general we recommend that you configure the GPS receiver to ouput only the messages that you need and leave all the other check boxes unchecked. Remember that there are a number of messages (GGA, GLL, RMC) that send out position information. You should ensure that only one is recorded by HYPACK.

For all DGPS applications, we prefer to receive the GGA and the VTG messages.

Use this device only for heading (On-The-Fly Gyro): Use this option in conjunction with a second GPS driver to calculate heading when using two GPS receivers that have their antennas mounted fore and aft of the vessel. This is often the preferred method on dredges and barges.

NOTE: Configure the driver for the forward GPS with the Position function and any other functions *except heading*. Configure the driver for the aft GPS with the Heading function and check the **Use This Device Only For Heading** option.

Record tide as depth saves the tide correction value calculated by the GPS driver as a depth if you have chosen the Depth option in the device setup.

Use GPS time for position records even when not synchronizing: If you use two GPS receivers and you are synchronizing your computer clock with UTC time, only the first GPS is synchronizing the computer clock with the GPS clock. However, the driver for the second GPS can

safely use the UTC time tag included in the GPS message because any two GPS receivers are synchronized to UTC time. When the checkbox is checked the driver assumes that computer clock is synchronized with the GPS clock and records position messages using the UTC time provided by the GPS receiver.

Use MSL height from GGA sentence assumes the MSL height provided by the GPS receiver is correct. If you have loaded a geoid in your geodetic parameters, it will be ignored.

Show Debug Messages shows the data in a scrolling display instead of the default updating table.

Ignore Checksum: Some devices use a different checksum calculation than we do. In this case, you may get a lot of bad checksum errors when the data is good. Check this option to skip the checksum routine and assume the data is good.

NTRIP Options

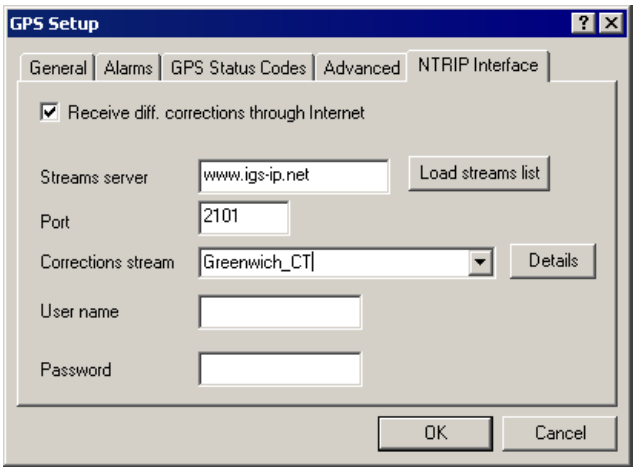
NTRIP (Network Transport of RTCM via Internet Protocol) enables you to receive your differential or RTK corrections on your Survey computer over an Internet connection. The stream server (or caster) receives the corrections from GPS stations and send them to their clients (in this case HYPACK® users).

NOTE: Do an Internet search to locate an NTRIP caster service. They can provide information about RTCM output format versions and output strings, as well as supported GPS models.

'**Receive differential corrections through Internet**' simply tells the driver to read data from the internet connection described on this tab. It will then send the data to your GPS receiver through the same port on which is sends position data to HYPACK®.

IMPORTANT! You must configure your GPS receiver to accept the corrections through the port defined under 'Connections' for the GPS.dll.

FIGURE 2-18. GPS Device Setup dialog - NTRIP Tab



Streams Server: Address of the stream server.

Port: Most stream servers use port 2101.

[Load streams list]: After you have entered the stream server address and port, click this button to populate the list of corrections streams.

[Details] displays information about the station from which you are reading data.

Correction Stream: Select the corrections stream closest to your project area.

User name and **Password**: Required only if you must pay to subscribe to the stream. (Some casters are free!)

If the driver is receiving NTRIP data, the GPS device window in SURVEY includes an 'NTRIP bytes' item which should continue to increase over time.

GPS Offsets

Forward and Starboard offsets are measured relative to the vessel origin.

Enter the **antenna height** *below* the static water line. In most cases, this will be a negative number. It should be positive only for users who want to reduce the GPS height to the transducer.

For RTK antennae:

- **If you are using a KTD file**, enter the height of the GPS antenna above the static water line as usual.
- **If you are working without a KTD file** enter the height of the GPS antenna minus the height of the reference ellipsoid above the chart datum as your antenna height.

Yaw, Pitch, Roll calculated by the Patch Test.

Enter **latency** according to the results of your Latency or Patch Test.

Beware!

BEWARE! Beginning with our 2006 release, in most cases, this value should be a *negative* number to indicate that it is above the water line. It will only be positive to reduce the GPS height to the transducer.

POS-MV NETWORK CONNECTIONS IN HYPACK® AND HYSWEEP®

The POS MV is a Position and Orientation System that outputs position, heave, pitch, roll and heading data. Data output may be through network (ethernet) or serial connection to the survey computer.

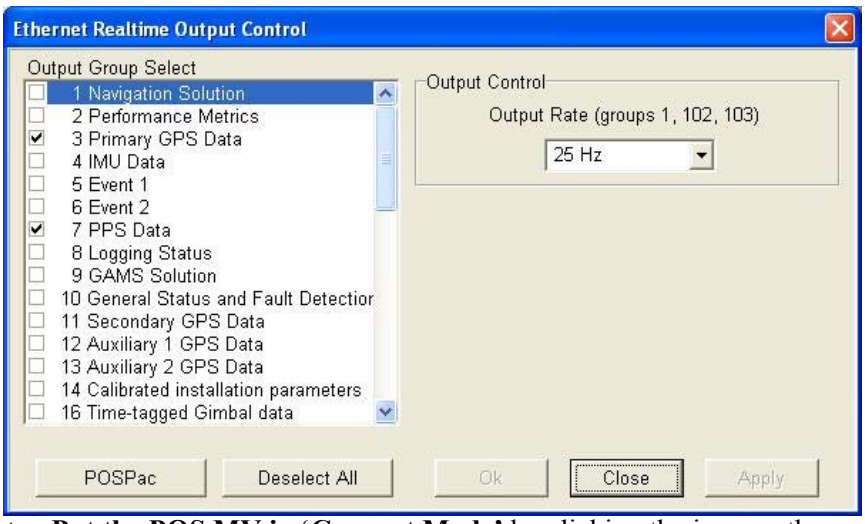
Recently, we have been developing network drivers for the POS MV. Though there is still discussion and testing of various configurations in the POS MV controller as well as HYPACK® Hardware in progress, there is at least 1 configuration, with which Mike Kalmbach has had consistently good results in the field.

The information in this document describes his findings. It pertains *only to the network devices*.

CONFIGURING THE DEVICE OUTPUT IN MV-POSVIEW

Use the MV-POSView program (in the POS MV device) to configure the device output message groups required by HYPACK®.

FIGURE 2-19. *POSView*



1. **Put the POS MV in 'Connect Mode'** by clicking the icon on the toolbar.
2. **Select LOGGING-ETHERNET REAL TIME**. The output realtime control dialog will appear.
3. **Select only the following output groups at 25 Hz**.

TABLE 2-5. *POS MV Output Groups*

Function	Output Group
Navigation + POS MV ver 3 solution status	Group 3
Time Synchronization	Group 7
POS MV ver 4 solution status	Group 20
Heave, pitch, roll, heading	Group 102

NOTE Additional selected groups will cause system failure.

INTERFACING THE POS MV WITH HYPACK®

There are drivers for the POS MV in both HYPACK® HARDWARE and HYSWEEP® HARDWARE. The following sections describe how to configure your system for each type of survey.

SYNCHRONIZING YOUR COMPUTER TO THE POS MV TIME

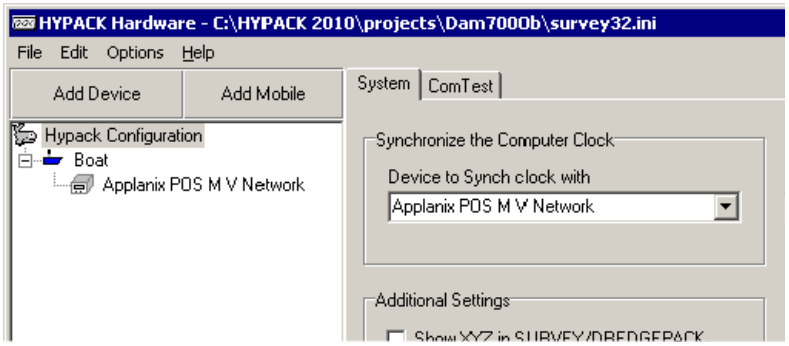
In any survey, accurate time-tagging is of paramount importance.

Because of the excellent accuracy of the UTC time-tagging in the POS MV, there is typically no need for a 1PPS box and we synchronize the system to the POS MV time output. HYPACK® converts the time tags to local time and synchronizes the computer time clock based on your Windows™ settings. Data from additional devices are then time-tagged based on the computer time so all should be synchronized based on the POS MV.

To synchronize the survey computer clock with the POS MV:

- Select 'Use POS MV time-tags even when not synchronizing' in your POS MV driver setup.

FIGURE 2-20. *HYPACK® HARDWARE– Synchronizing your survey computer to the POS MV*



- Select the POS MV under 'Synchronize the Computer Clock' on the System tab of HYSWEEP® HARDWARE.

POS/MV IN SINGLE BEAM PROJECTS

The single beam configuration is simple. All data from the POS MV is recorded using the Applanix POS MV Network driver (posmv.dll). Other devices are configured normally.

HYPACK® Hardware Configuration:

1. **Add the posmv.dll to your hardware configuration**.
2. **Check all data types you wish to record from the POS MV**.

NOTE While the POS MV is very good with horizontal position, some users are less comfortable with the vertical positioning. If you are doing RTK tide corrections, you should run some tests and make this decision for yourself.

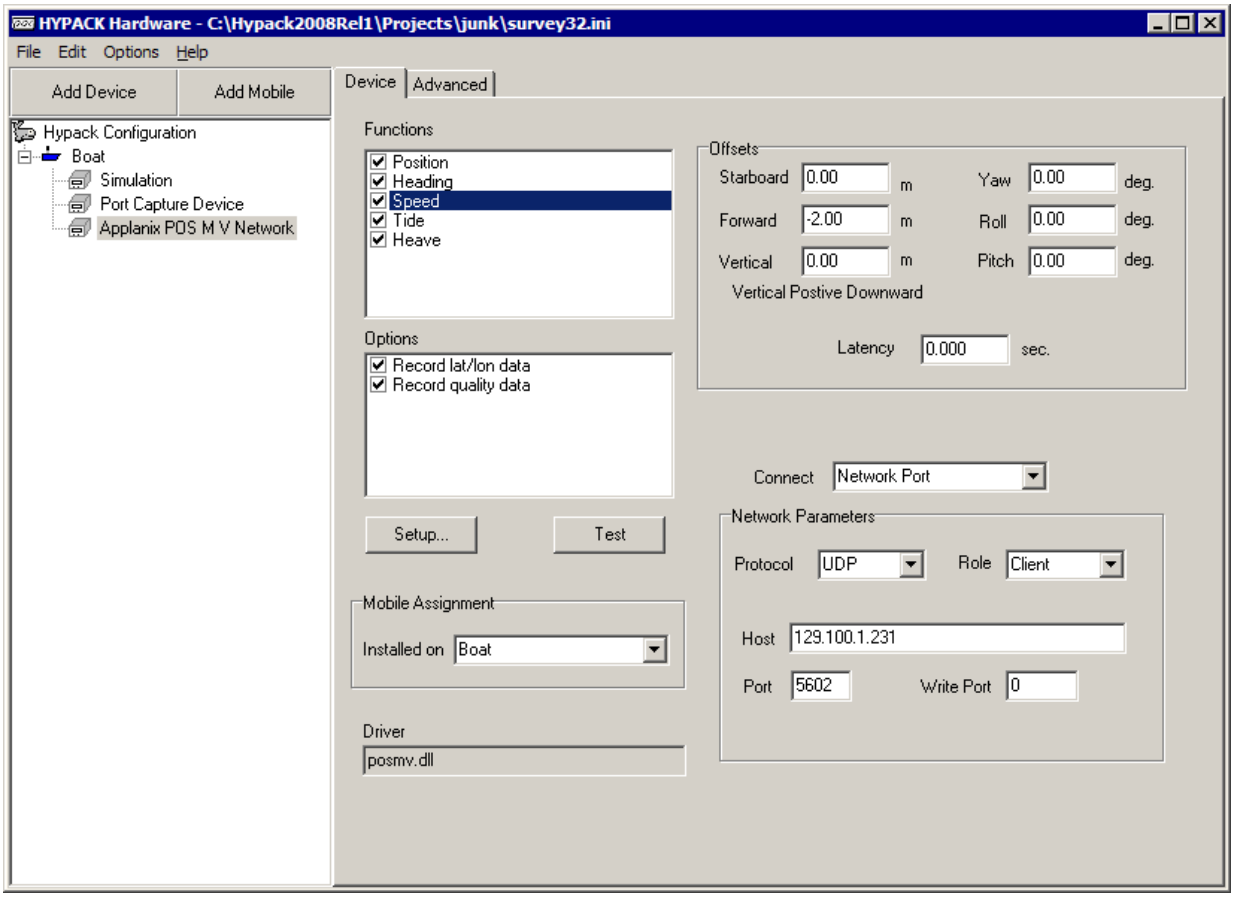
---

3. **Enter other settings as follows**:

TABLE 2-6. *POS MV Configuration*

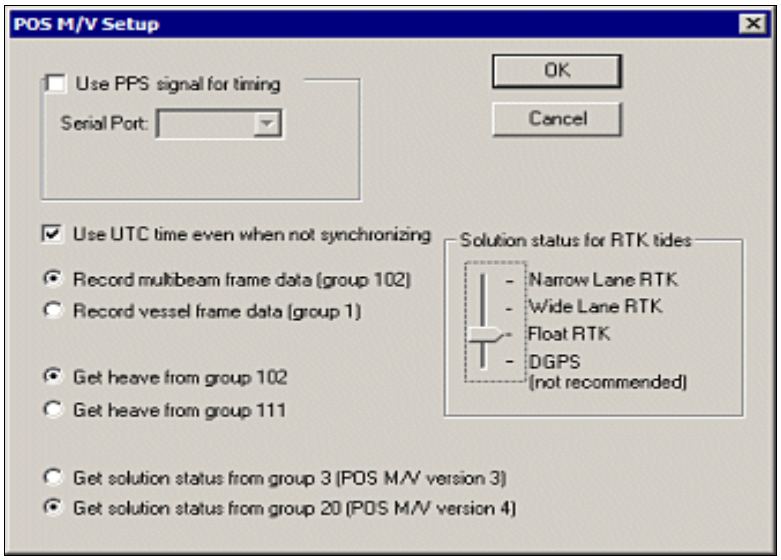
Offsets	• The **starboard, forward** and **vertical** offsets are measured relative to your boat reference. • **All other offsets** are zero.
Connect	• **Connect**: Network Port • **Protocol**: UDP • **Role**: Client • **Host**: Enter the IP address for the POS MV • **Port**: 5602

FIGURE 2-21. *Posmv.dll Device Setup*



4. **Click [Setup] to access the Driver Setup dialog, set the options as follows and click [OK]**.

FIGURE 2-22. *Posmv.dll Driver Setup Dialog*



- **Use PPS signal for timing:** This is only required when you apply delayed heave processing in the SINGLE BEAM EDITOR program.
- **Use UTC time even when not synchronizing**: Check this option. When you select the POS MV under 'Synchronize the Computer Clock' on the System tab, it keeps all time tags synchronized to the POS MV output.
- **Select the Record multibeam frame data. (Group 102).** This **returns position data at a location called "sensor 1" in Applanix documentation. This is normally the multibeam sensor head, but it can be any user-specified point. (It's does the same thing as group 1 with all '0' offsets.)**

NOTE We have not yet seen a successful configuration using Group 1. If you have and are willing to share your project, we would love to see it!

- **Select 'Get heave from group 102'.**
- **Select the solution option according to the version of the POS MV you are using.** (Hint: If you have a Group 20 in your menu, you have a version 4 device.)
- **Solution status for RTK tides:** The slider only controls the calculation of the tide value (If you do not have RTK, it does not calculate tide.). Enter Float RTK to record the most data. You can filter the lower settings in post-processing if you want to.

5. **On the System tab,** select the POS MV under 'Synchronize the Computer Clock'.
6. **Save your configuration and exit HYPACK® HARDWARE**.

POS/MV IN MULTIBEAM PROJECTS

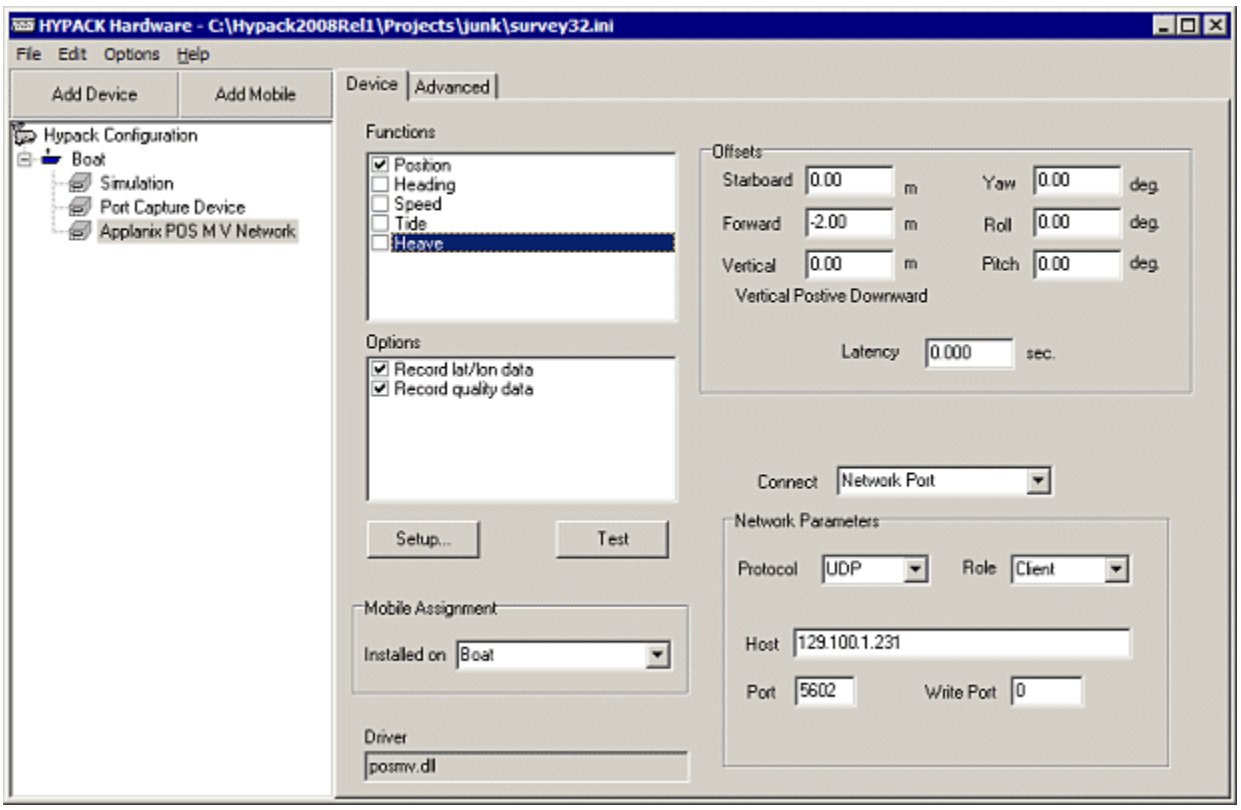
In all HYPACK® surveys, position comes from HYPACK® SURVEY. For multibeam surveys, the POS MV must, therefore, be configured in both HYPACK® HARDWARE and HYSWEEP® HARDWARE.

HYPACK® HARDWARE Configuration:

Record position using posmv.dll. The settings in HYPACK® HARDWARE are shown in the following dialogs.

Offsets: The starboard, forward and vertical offsets are measured relative to your boat reference. All other offsets are zero.

FIGURE 2-23. Posmv.dll Device Setup



The settings in the Driver Setup dialog are the same as in the single beam configuration.

HYSWEEP® HARDWAREConfiguration:

The HYSWEEP® Applanix POS/MV Network driver records the heave, pitch, roll and heading. This provides the data to HYSWEEP® SURVEY at the required 25Hz. (It will not work to record all POS MV data in HYPACK® SURVEY and pass the heave, pitch, roll and heading through shared memory because shared memory is not capable of this speed.)

TABLE 2-7. Pos MV Configuration in HYSWEEP® HARDWARE

Offsets	**MRU**	• **Starboard**: POS/MV IMU location starboard of boat reference. • **Forward**: POS/MV IMU location starboard of boat reference. • **Vertical**: POS/MV IMU location relative to waterline (positive below). • **Yaw**: Enter 0. • **Pitch, Roll**: Enter 0 (MRU pitch/roll offsets are typically zeroed within the MRU itself). • **Latency**: Enter 0.
	Gyro	Set all offsets to 0.

Setup Options	None
Connection Information	• Check the **Enabled** option. • **Port**: 5602 • **Internet Address**: Enter the IP address for the POS MV

DELAYED HEAVE PROCESSING

Delayed heave processing can be applied to POS/MV Version 4 data in the SINGLE BEAM EDITOR or HYSWEEP® EDITOR to smooth the effects to smooth the heave in areas where it was affected by such things as turning, acceleration and deceleration.

If you want the option to use this editing feature, you will need to think ahead. Be sure the time stamps on all of your data are synchronized. This is not an issue when you are using the POS/MV Network driver; all time tags are based on the POS/MV UTC time.

When you are logging your data, it is important to adhere to the following sequence. Otherwise, you may not have the data required by the Delayed Heave calculations.

1. **Start the POS/MV logging 'Group 111' Heave data**.
2. **Start HYPACK® SURVEY (and HYSWEEP® SURVEY if** HYSWEEP® devices are part of your hardware configuration).
3. **Log your survey data**.
4. **End logging with HYPACK® SURVEY and HYSWEEP® SURVEY only**.
5. **Continue to log data with the POS/MV for at least 5 minutes**.
6. **Stop logging with the POS/MV**.

Delayed Heave corrections may now be smoothed in the Heave window of phase 1 in the SINGLE BEAM EDITOR or HYSWEEP® EDITOR.

More Information

• "Applying True Heave in POS/MV and F180 Data" on page 6-53

ECHOSOUNDERS

Echosounders are devices that measure depth. They come in several varieties. These include single beam systems, dual frequency systems, multiple transducer systems and multibeam systems.

ECHOSOUNDER TYPES

SINGLE BEAM ECHOSOUNDER SYSTEMS

Single Beam Systems measure a single depth below the echosounder transducer. There are over twenty different single beam echosounders that have been integrated into HYPACK®. The integration is usually straightforward.

Single frequency systems store data in the survey program as **EC1 Records**. These records contain the Device Number, the Time Tag and the Depth received from the echo. Single beam echosounder data is edited in the SINGLE BEAM EDITOR.

DUAL FREQUENCY ECHOSOUNDER SYSTEMS

Dual frequency systems provide depth measurements from two transducers and report them over a single interface. Typically, you have a high frequency and low frequency transducer connected. HYPACK® can support over ten different dual frequency systems. During the SURVEY program, you will see two depths in the CHART DISPLAY window. During the editing process, you will see both frequency transducers and can edit them simultaneously. The ALL format has room for two separate depth values. When you create a final product, whether it is plotting a smooth sheet, exporting depths or creating TIN models, you must decide whether to use the high or low frequency values. Since there is minimal separation between the two transducers, you only need to specify a single offset value when specifying the offset values in the HARDWARE program.

Dual frequency systems store data in the SURVEY program as **EC2 Records**. These records contain the Device Number, the Time Tag, and the High and Low Frequency Depths. The high frequency depth is normally configured as “Depth 1” and the low frequency depth is “Depth 2”. You can set up some echosounders so this is reversed. Dual frequency data is edited in the SINGLE BEAM EDITOR.

MULTIPLE TRANSDUCER SYSTEMS

A Multiple Transducer System may have from three to thirty-two transducers arrayed in a line on the vessel. The offsets for each transducer are specified in the OFFSETS tab of HYSWEEP® HARDWARE . This information is appended to the header of all RAW data files that use multiple transducer systems.

HYPACK® can collect data from these types of systems and store it in **ECM Records**. These records contain the Device Number, the Number of Transducers and the Measured Depth For Each Transducer. This data can only be edited in the multibeam processors.

More Information

- “Multiple Transducer Offsets” on page 2-166

MULTIBEAM SYSTEMS

A Multibeam System takes from thirty to sixty depth measurements at constant angles every update. This data is logged as **SB2** Records in the Raw data file. Each record contains the Device Number, the Number Of

Data Records that follow, the Multibeam Measurement Information for each beam and the Multibeam Quality Information for each measurement.

You can also use the Hysweep.dll to pass the nadir depth to HYPACK® SURVEY where it will be stored as an EC1 record. This is done by checking Depth in the device setup dialog.

Data from multibeam surveys can only be processed in the HYSWEEP® EDITOR program.

Seabed ID Systems

Certain echosounders record two echo return values (E1 and E2) in addition to the depth. These values vary according to the roughness and hardness of the bottom composition. This enables you to define various bottom types by a specific range of E1 and E2 values from the echosounder.

The SeabedID device driver refers to a user-defined table of E1-E2 ranges and bottom classifications to assign a Seabed ID number for each sounding record during SURVEY. The E1 and E2 values are time tagged saved with the Seabed ID number to an ROX record in the raw data file. If this driver is used to paint the matrix, SURVEY will fill the matrix using Seabed ID colors based on the Seabed Square created in SEABED STATISTICS for your survey area and designated in the driver setup.

To do all of this requires a little preparation:

1. **Do your bottom truthing** in your survey area to determine the echo return values that correspond with each bottom type in your area.
2. **Use SEABED STATISTICS to create a Seabed ID Square**. This (*.RXW) file contains the classifications for your project area and their corresponding E1 and E2 ranges.
3. **Use the SeabedID device driver (SeabedID.dll) in your Hardware Setup**, specifying your Seabed ID Square (*.SIX) in the Driver Setup dialog.

NOTE The SeabedID driver should replace the Roxann.dll or Echoplus.dll in the hardware configuration of any Seabed Classification projects created before HYPACK® MAX version 4.3A Gold.

More Information

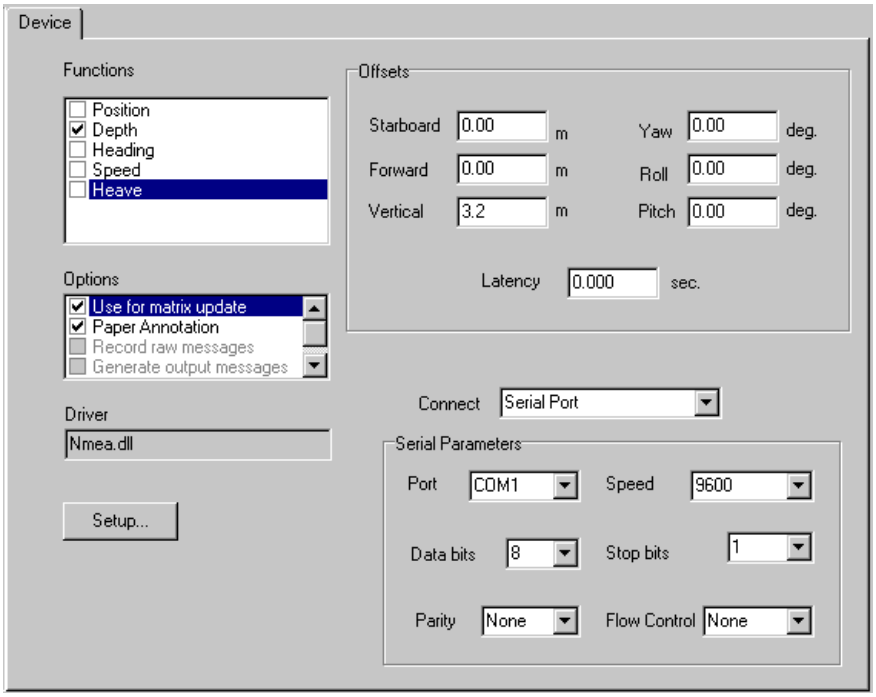
- “Seabed Statistics” on page 8-182

Echosounder Settings

Echosounder Device Setup

A typical device setup for echosounders is generally very simple.

FIGURE 2-24. *Echosounder Device Setup Dialog*



The settings in most Device Setup dialogs for Echosounders are all the same: the function, logically, is "**Depth**" and the enabled Options (Use for Matrix Update and Paper Annotation) are available to be selected.

The **Raw Data,** and **Quality Data** are automatically recorded. This is desirable because it enables you to re-compute positions in post-processing should you enter bad datum transformation parameters during the data collection.

Raw Data records:

- WGS-84 latitude
- WGS-84 longitude
- WGS-84 ellipsoid height

Quality Data records:

- Device Number
- Time Tag
- WGS-84 PDOP/HDOP
- Number of Satellites
- Quality Information

Use for Matrix Update instructs the program to use depth data from that device to color code the matrix during SURVEY. If you are using more than one echosounder system, check this option for only one system.

Paper Annotation marks events on your paper record.

Depending on the device capabilities, there may be additional selections under Type, and Paper Annotation may not be an option.

More Information

- "Annotation and Event Marks" on page 2-221

Echosounder Driver Setup

Driver Setup dialogs are customized according to the individual device capabilities and the information that HYPACK® needs to access and use them. They may define anything specific to the driver. Typically you will define:

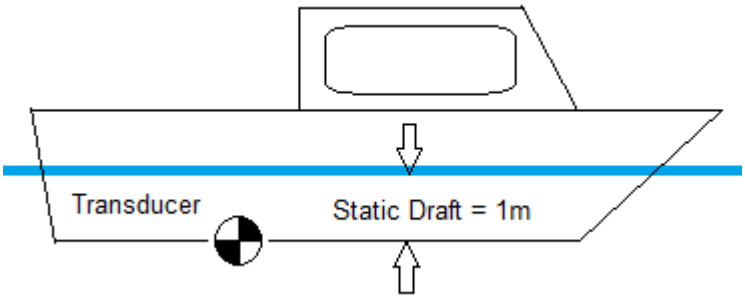
- Display properties of the Device Window in SURVEY
- Annotation settings
- Device settings

Echosounder Calibration

Depth sent to the computer is sum of the measured depth from the transducer to the bottom transducer and the static draft correction.

The 'Static Draft' represents the vertical offset of the transducer beneath the static waterline. 'Static' refers to the fact that the vessel is not moving.

FIGURE 2-25. *Static Draft*



In HYPACK®, Static Draft (and Dynamic Draft) are measured positive downwards. The deeper the transducer is beneath the static waterline, the larger (more positive) the Static Draft Correction.

Static Draft can be corrected in one of two different methods in HYPACK®.

- **Enter the Static Draft adjustment into the Echosounder and set the vertical offset for the echosounder to 0.00 in the HYPACK® HARDWARE program.** Most surveyors use this method. The echosounder will then output a sounding that incorporates the static draft.
- **Set a Static Draft adjustment of 0.00 into the Echosounder and enter the static draft as the vertical offset into HYPACK®.**

Beware!

BEWARE! Do one or the other, *but not both*. Otherwise, you will be double-correcting for the Static Draft.

NOTE: If you are using Real Time Kinematics referencing the water line, you must include the static draft in your echosounder to get the correct tide information.

More Information

- "Bar Checks" on page 2-173
- "Multibeam Bar Check Tool" on page 2-175
- "Multibeam PATCH TEST" on page 2-177
- "Finalizing Hardware Offsets Using Calibration Test Results" on page 2-186

ANNOTATION AND EVENT MARKS

An **event mark** is a line drawn across the echosounder chart at your specified intervals. In HYPACK® these intervals can be based on Distance Traveled (based on the trackline) or Time Elapsed. The event increment is specified in the NAVIGATION PARAMETERS menu of the SURVEY program. If your echosounder has event mark and annotation capability, the device driver will normally take care of these functions. Some of the device drivers require you to select the Annotation option in the SETUP window.

Sending a character to the echosounder triggers most event marks. The echosounder draws a solid line across the chart on the next update cycle. Annotation is treated differently on various echosounders. On some sounders, the echosounder has to go into "annotation mode". It stops taking soundings and transmitting records until the annotation has been printed. This is the reason some users find "gaps" in their sounding data just after event marks.

The annotation strings are "fixed" and cannot be changed. What you see is what you get. If you desire a different annotation string, you can contract with HYPACK, Inc. to custom tailor the device driver to send the exact string you desire.

INTERFEROMETERS

Interferometry diagnoses the properties of two or more waves by studying the pattern of interference created by their superposition. In hydrography, the interferometer analyzes the way the waves in the ping returns overlap to precisely measure depths. Interferometric systems provide shallow water, wide swath bathymetry.

HYSWEEP® SURVEY supports several interferometers, however they typically output more than 1440 beams per ping—the maximum number

allowed by HYSWEEP® SURVEY. For this reason, the data must be filtered and downsampled during data collection to be stored to the multibeam raw file (*.HSX). Filtering the data also removes extraneous data and improves bottom tracking.

Some devices can filter the data before sending it to the survey computer, flagging data outside of its filter criteria. If you pre-filter the data, you may set HYSWEEP® SURVEY to honor the flags generated by the device or ignore them by checking the 'Ignore manufacturer flags' option in the Interferometry Options dialog.

Some interferometer drivers support recording the full data set to the device manufacturer's native format (RDF, SXI, or K8E) in addition to the HYSWEEP® HSX files. HYPACK® does nothing further with these files.

To record the additional data file, check the 'Record Raw Message' option in HYSWEEP® HARDWARE on the Connect tab.

More Information

- "Interferometry in HYSWEEP® SURVEY" on page 3-137

SUB-BOTTOM PROFILERS

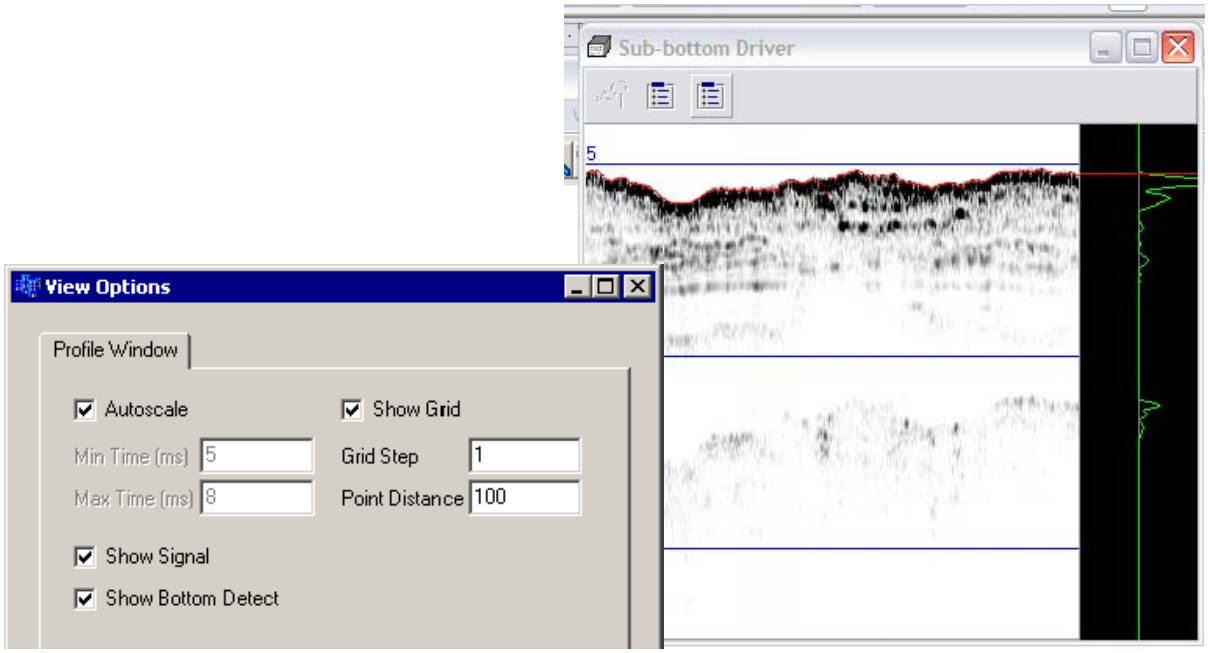
Sub-bottom profilers have two transducers using different low-frequency pings to sound the bottom. They are different than dual frequency sounders in that:

- The frequencies used are much lower, which provides greater penetration of the softer, surface sedimentation.
- Depth soundings are not survey quality.

Configure the device in HYPACK® HARDWARE with the subbot.dll. HYPACK® records a pair of data files for each line—a raw file and a SEG Yfile.

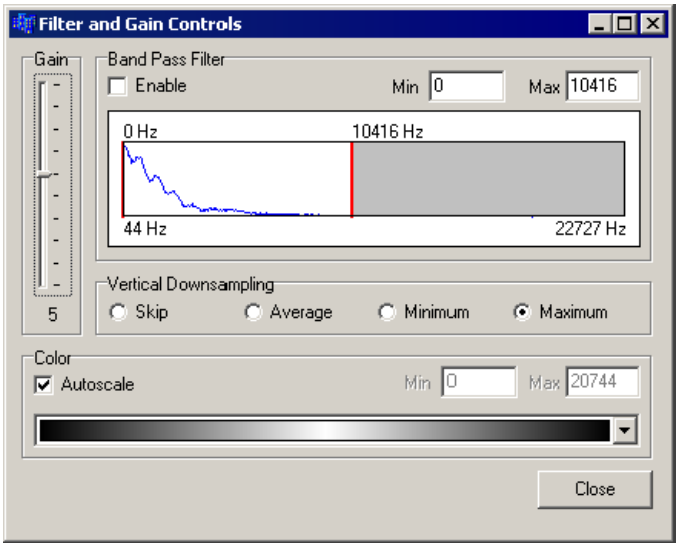
In SURVEY, the subbot device window shows the latest signal and a scrolling history. You can configure the subbot driver device window to display one panel for *either* frequency or two panels--one for *each* frequency. Each panel may also include a vertical grid at user-defined intervals, the bottom track and tide lines, as well as target and event markers.

FIGURE 2-26. *Configuring the Subbot Device Window*



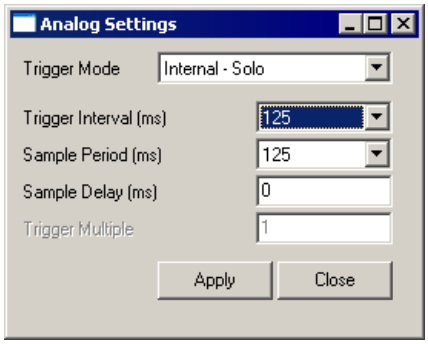
Filter and Gain Controls provide flat gain, FFT band pass filtering and several color palette options.

FIGURE 2-27. *Filter and Gain Controls*



If you are using an analog device, the triggering mode, interval, sample period and delay are configured in the Analog Settings dialog which is accessed from the device window.

FIGURE 2-28. *Analog Settings*



At any time you may take screen captures or print either display.

Data collected with the subbot.dll can be loaded to the SUB-BOTTOM PROCESSOR. There you can mark targets and digitize your layers.

When you mark targets in the SUB-BOTTOM PROCESSOR they are saved to a target file named using the date and time derived from its position in your data.

Each digitized layer is saved to an All format file, which can then be displayed and plotted in CROSS SECTIONS AND VOLUMES.

More Information

- "Sub-bottom Processing" on page 8-112

HELMSMAN DISPLAYS

Various devices have been created to provide HYPACK® information for the helmsman. Most surveyors provide optional information to the helmsman by using one of the following options:

- Virtual Screen
- Broadcasting the required windows over the network.
- Video Splitter
- USB Helsman Displays
- Serial Helmsman Display (LCD4.DLL)

VIRTUAL SCREENS AS HELMSMAN DISPLAYS

The SURVEY program of HYPACK® supports virtual screens. This allows you to have a separate helmsman monitor.

The SURVEY program supports multiple, independently configured area map, left-right indicator and data display windows. If the helmsman requires a different display, you could configure additional settings for his needs.

It will be easier to configure the separate helmsman monitor if it is brought next to the normal HYPACK® monitor. You can then easily click and drag the desired windows to the helmsman monitor. Exit SURVEY and the window configuration will become the default setup the next time you start the program.

Although HYPACK® supports virtual monitors, it does not contain the hardware or drivers to create virtual monitors. This must be provided through a separate vendor.

Broadcast Survey Windows as Helmsman Displays

With the advent of network capabilities in HYPACK®, you can broadcast your choice of SURVEY windows over the network. This introduces the option to broadcast the windows required by the helmsman over the network. The helmsman computer can receive the broadcast using the WINDOW VIEWER program.

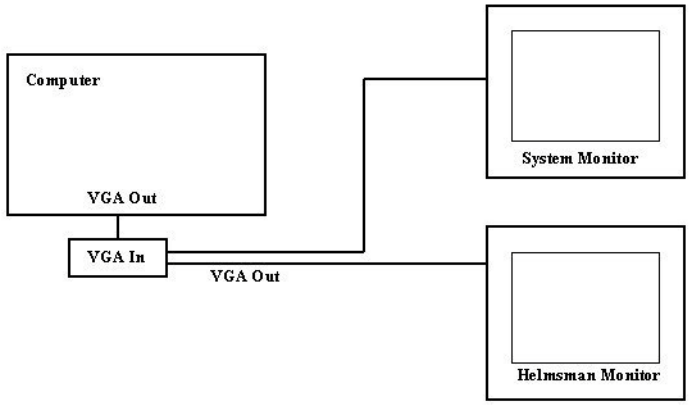
More Information

- "Broadcasting Survey Windows over the Network to the Survey Viewer" on page 3-18

Video Splitters - Duplicate Displays

Video Splitters take the VGA output signal from your desktop or notebook and duplicate it so that two or more monitors can display the same screen. This requires a special hardware box called a Video Splitter. The video output from you computer is connected to the Video Splitter. The Video Splitter then reproduces the identical output and amplifies it for anywhere from two to eight additional video monitors. The following figure represents the normal hardware setup.

FIGURE 2-29. *Hardware schematic for using a Video Splitter*



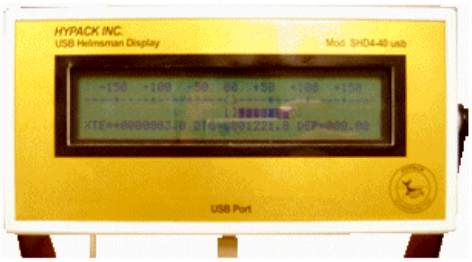
This is a hardware solution that does not require any special settings in the HYPACK® package, but you need special video cards that are supported by your operating system. The advantage is that it provides a tremendous amount of information to the helmsman. The disadvantage is the helmsman display cannot be configured to meet special needs of the helm, without changing the display on the system monitor.

Most notebook computers can provide VGA output to their screen and to a separate monitor simultaneously. This is the same thing as using a video splitter. There are no special settings in the HYPACK® software. It is totally a hardware solution.

USB Helmsman Displays

Many of the newer computers, particularly laptops, are short on ports, both serial and parallel. You can take advantage of the USB ports by using a USB Helmsman display. The USB Helmsman Display is an LCD display that will give you a left/right indicator and also display XTE (cross track error), DTG (distance to go along your planned line) and DEP (depth).

FIGURE 2-30. *USB Helmsman*



NOTE *Do not* use USB ports for data collection.

To interface this with your PC, just plug it into your USB port. Windows XP will automatically load the serial drivers. Other operating systems will ask you for the drivers. A CD containing these drivers is provided with the device.

Once installed, your USB Helmsman Display will be recognized by your PC as a serial port. You can then include it in your hardware setup using the LCD4.dll.

The USB Helmsman Display is available from HYPACK, Inc..

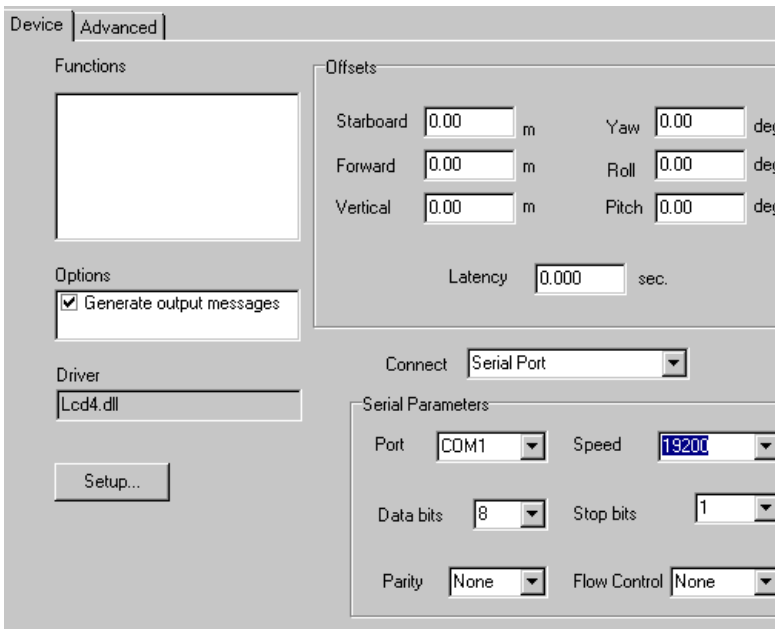
Serial Helmsman Displays

To Install the Serial Helmsman Display:

1. **Start the HARDWARE program** from the HARDWARE icon.
2. **Click on the "Add New Device" phrase**.

3. **Select the LCD4.DLL dee driver and complete the Device Setup dialog.** The following figure shows a typical Device Setup dialog for the LCD4.DLL.
   - The **Generate Output Messages** box will be checked by default.
   - **Connect** to the Serial Port.and configure the Serial Helmsman Display for a baud of 19,200, no parity, 8 databits and 1 stop bit. The Serial Helmsman Display requires its own serial port. You cannot combine any item in series with it.

FIGURE 2-31. *Serial Helmsman Display Device Setup dialog*



MOTION SENSORS

Motion sensors detect **heave** (vertical displacement), **pitch** (rotation about an axis that runs from port to starboard through the ship's center of mass) and **roll** (rotation about an axis that runs from stern to bow through the ship's center of mass).

The MRU should be placed as close as possible to the vessel's center of gravity.

The heave-pitch-roll data is saved in the Raw data files as HCP Records. These records contain the Device Number, Time Tag, Heave, Pitch, Roll and Status Flag. The HCP records are used when processing data in the SINGLE BEAM EDITOR for single and dual frequency data or the HYSWEEP® EDITOR program for multiple transducer and multibeam data. Each program takes the exact time of the depth measurement and then interpolates heave-pitch-roll information for the exact time that the depth was measured.

FIGURE 2-32. *Heading-Pitch-Roll Data in the HYSWEEP® EDITOR for multibeam and multiple transducer systems*

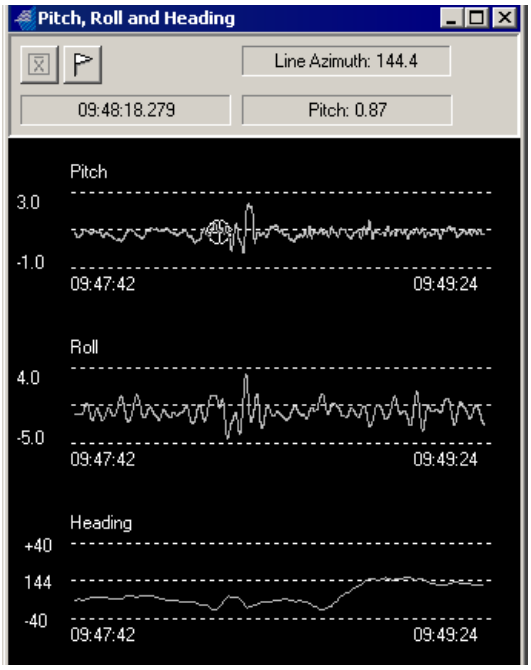
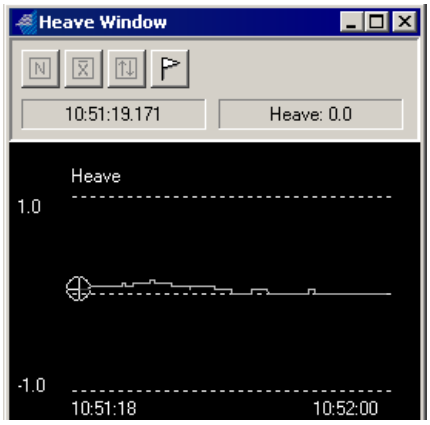


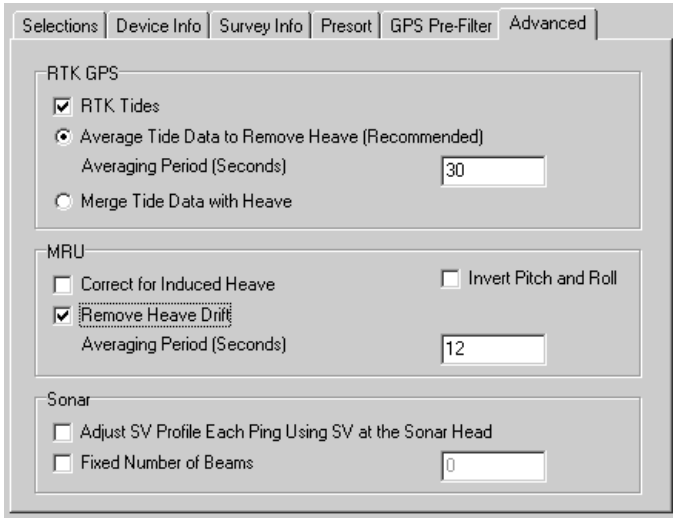
FIGURE 2-33. *Heave Data in the HYSWEEP® EDITOR*



In the SINGLE BEAM EDITOR, it is possible to tell the program whether or not to apply heave, pitch and roll settings. The position of the echosounder beam can also be calculated, using the pitch and roll information. This is implemented by checking the Steer Sounding Beam box in the Advanced Read Parameters in the editor program.

Some devices can be set to output data for its position at the pivot point of the boat or for the calculated position of the echosounder. In HYPACK®, always output data for the MRU position and let your HYPACK® programs do the necessary calculations.

FIGURE 2-34. *Specifying corrections for Motion Reference Units*



TELEMETRY TIDE GAUGES

Telemetry tide gauge device drivers either interrogate the tide equipment at your specified intervals or simply record the values when the devices decide to send an update.

The SURVEY program writes the initial tide correction in the header of each data file. Any time a new tide reading arrives, it is time tagged and written to the RAW data file as a TID record. TID records are decoded in the SINGLE BEAM EDITOR (for single and dual frequency data) or the HYSWEEP® EDITOR (for multiple transducer and multibeam systems). A tide correction is determined for each sounding, based on the last available tide reading. Neither program interpolates between TID records.

More Information

- "Manual Entry of Tide Corrections in Survey" on page 3-64
- "Tide (Water Level) Corrections" on page 8-1
- "Tide Corrections in the Single Beam Editor" on page 4-13
- "Tide Corrections in the HYSWEEP® EDITOR" on page 6-8

GYROS

HYPACK® has the following options to determine the vessel orientation:

- Use the course made good of the GPS antenna.

- Use the course made good as calculated by the HYPACK® SURVEY program.
- Use a fluxgate compass.
- Use a survey quality gyro.
- Use a GPS system that uses an antenna array to provide orientation.
- Use two GPS systems with separated antennas to calculate the orientation.

Course Made Good: Almost any GPS device will calculate the course made good of the GPS antenna. If your GPS outputs a VTG message, you have access to the course made good. You can click on Heading in the Type box, and then the program will use the GPS course made good to orient the vessel.

Fluxgate Compasses provide accurate orientation information for most small survey launches. Care should be taken to determine whether the compass is outputting the magnetic heading or the true heading (magnetic plus deviation).

Survey Quality Gyros, such as the SR20, SR40, Robertson and Scandinavian Microsystems can be integrated using a device-specific driver or by using the GenGyro device driver.

GPS with Antenna Array: Certain GPS devices determine the vessel orientation (heading, pitch and roll) from an array of fixed GPS antennas. These devices provide both position and heading information.

Two GPS Systems: A special 'OTFGyro' (On-the-fly Gyro) option, is available in the GPS driver to determine the vessel orientation by using two GPS systems. By knowing the exact offset between these two devices, the driver compares the reported positions and computes the heading of the vessel. The most accurate calculations are attained from the most accurate GPS output and exact measurements of the separation between the two antennas.

Beware!

BEWARE! Without any 'Heading' device, the HYPACK® SURVEY program will default to using the calculated Course Made Good for the vessel orientation. If your transducer is located directly beneath your GPS antenna, this doesn't really matter and is only a matter of aesthetics. *If you have a significant separation between your GPS antenna and transducer, the presence of crosscurrents could provide error between the course made good and the actual vessel orientation.* The best solution is to make sure your transducer is mounted directly below your GPS antenna.

Beware!

BEWARE! *Care should be taken not to have two heading devices*. For example, some users absent-mindedly check the Heading function in the GPS Device Setup dialog when they already have a gyro configured. The heading will update every time the gyro and GPS update. This can cause the boat to "Twitch" between the two different heading values.

SOUND VELOCITY PROBES

Sound Velocity probes measure the changes in the speed of sound under varying conditions such as depth, temperature and salinity. Most commonly, sound velocity probes generate a text file of depth vs sound velocity readings. HYPACK® can import this data to generate sound velocity corrections files (*.VEL) for use in post-processing to correct for ray-bending which occurs at the transition between sound velocity layers.

The Odim MVP (Moving Vessel Profiler™) probe performs regular sound velocity casts while your survey vessel is underway. The HYPACK® MVP.dll reads the 'calc' data from the MVP device. It can:

- Record the data to VEL files to use in post-processing.
- Store the memory in Shared Memory to automatically update the sound velocity profile recorded in HYSWEEP® SURVEY.

IMPORTANT: HYSWEEP® SURVEY stores the most recent profle information to the data files *only at the start of each line. For the best accuracy*, record a VEL file on each reading (with date and timeappended to the file name) and correct your data in post-processing.

More Information

- "Sound Velocity Corrections in the Single Beam Editor" on page 4-17

MULTIPLE MOBILES

A hardware configuration can include more than one vessel or mobile, each at a different location and with its own positioning system. HYPACK® refers to each, unit as a vessel or mobile even though it may not be a separate and independently moving boat.

Typical examples of multivessel configurations include:

- A survey vessel with a towfish
- A dredge with one or more digging tools
- One HYPACK® computer monitoring signals broadcast over wireless connection from multiple vessels.

In such cases, we must know the position of each mobile and, in order to properly position your other data, which devices are on each mobile. To do this our hardware configuration defines the devices, the mobiles and which devices are on each mobile.

1. **Begin the HARDWARE program** by selecting PREPARATION-HYPACK HARDWARE.

2. **Create a mobile for each object whose position you are tracking**. Click [Add Mobile]. A new mobile will be added to the configuration list.
3. **Name the mobile.** (Optional) When you add a mobile, it will be named 'mobile#' by default. It may be less confusing if you name it something meaningful to your configuration. Click on the mobile name and type in the new name.
4. **Set up all of the devices.** You will need a positioning device for each vessel such as a GPS, cable counter (towcable.dll) or inclinometer.

NOTE Offsets for each device should be relative to the origin of the vessel on which it resides.

Beware!

BEWARE! *When the position of a mobile is calculated relative to another mobile, the horizontal offset signs are reversed from the normal convention*. ie distances port and forward of the origin are negative and distances starboard and aft of the origin are positive.

5. **Assign the devices to their mobiles.** This allows SURVEY to calculate the proper position for the other data collected.
6. **Check your results in SURVEY** to verify your positioning is accurate.

In SURVEY and DREDGEPACK®, you can assign different features such as color, shape and labels to help distinguish multiple mobiles from each other in the Map and Data Display windows.

More Information

- "Vessel Settings in HYPACK® HARDWARE" on page 2-141
- "Dredge Configurations" on page 2-241
- "Boat Features in HYPACK® SURVEY" on page 3-33

MOBILE OFFSETS

Beware!

BEWARE! When the position of a mobile is calculated *relative to another mobile*, SURVEY has an idiosyncrasy that reverses the horizontal offsets specified for the attachment point.

For example, if your device was port 3 and aft 10 survey units from the origin on the mobile, you would normally specify a starboard offset of -3 and a forward offset of -10. If this is an offset for the attachment point (e.g. the A-frame for a towcable or the trunnion on an excavator dredge), SURVEYwill interpret the same offsets as starboard and forward of the origin.

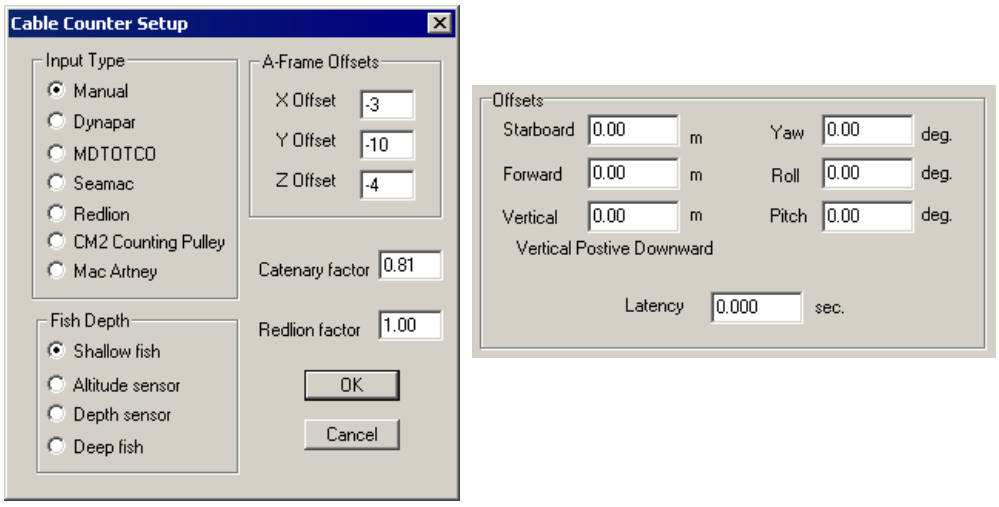
To accommodate this idiosyncrasy:

- **Specify offsets in the driver setup dialog where available.** Some drivers, such as the towcable driver, include offsetsin the driver setup

dialog (accessed when you select the driver and click [Setup] in HYPACK® HARDWARE). There, you can enter the offsets using the normal sign convention and leave the forward, starboard and height offsets in the Device tab of HYPACK® HARDWARE set to zero.

NOTE: The anntenna height offset can be entered using the normal sign convention either in the driver setup or in the Device tab, but *not both*!

FIGURE 2-35. *Towcable Driver Setup (left), Offsets (right)*



- **Reverse the signs for the X, and Y offsets.** Drivers without offsets in the driver setup dialog, such as the Trackp driver, require that you reverse the signs of the forward, starboard offsets in the offsets on the Device tab.

FIGURE 2-36. *Trackp Driver Setup (left), Offsets 10m port and 3m aft(right)*

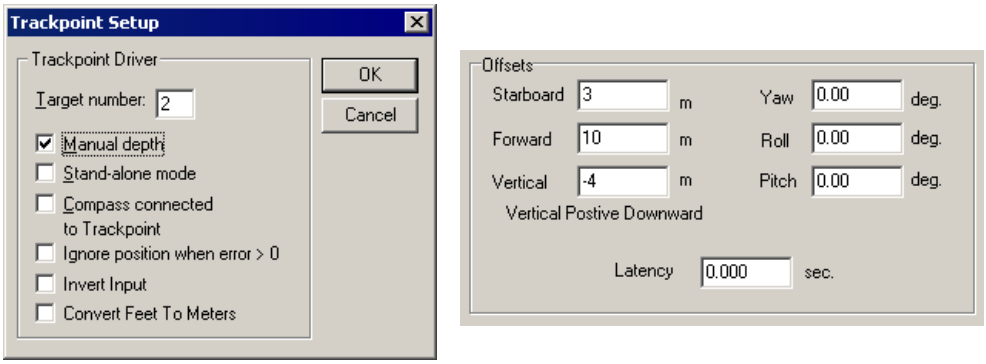
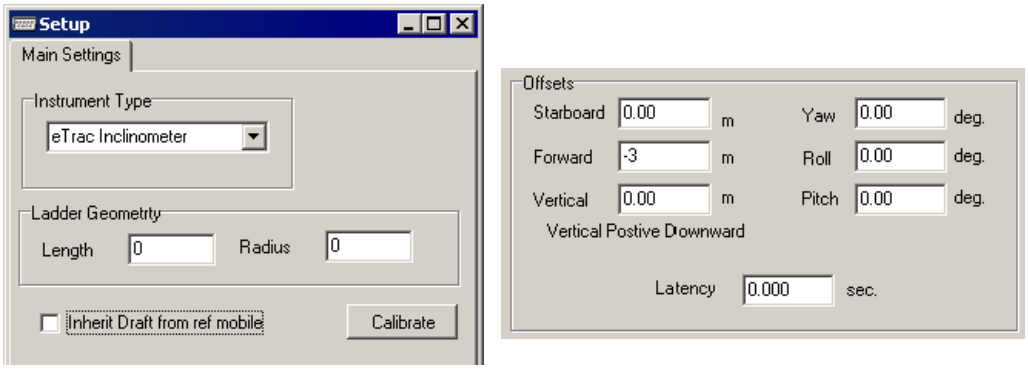


FIGURE 2-37. *Inclinometer Driver Setup (left), Offsets to the trunnion 3m forward of the dredge origin (right)*

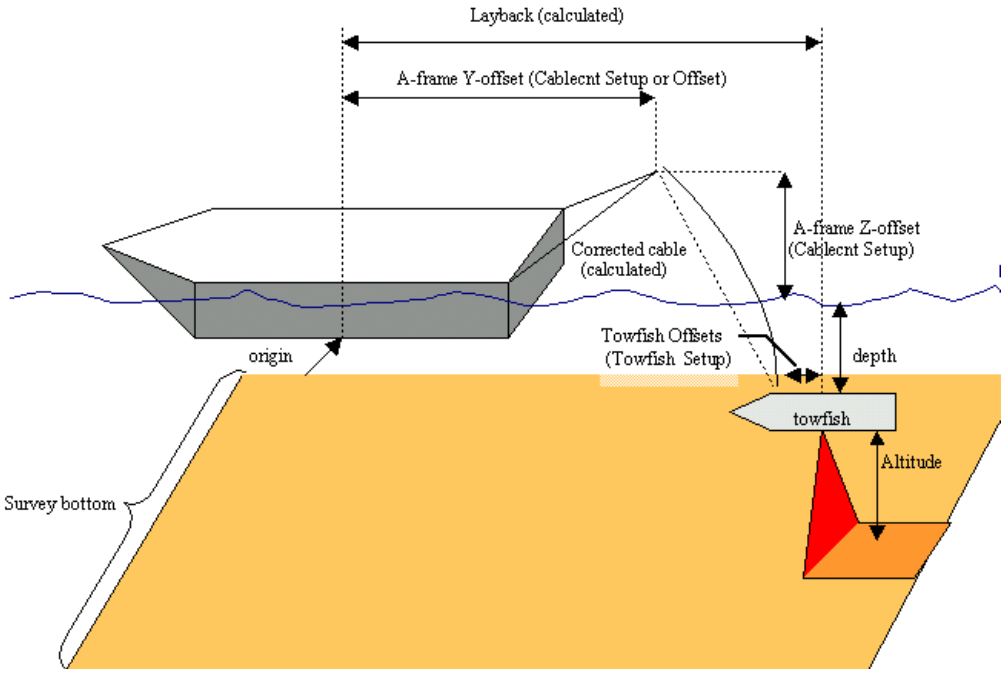


TOWFISH WITH SIMPLE LAYBACK

In certain surveys, you need to position devices, such as a magnetometer or side scan towfish, by using a simple layback formula. HYPACK® supports up to 10 such devices in your hardware setup.

The following figure provides details on configuring the HARDWARE and SURVEY programs for this operation. We have used a towfish as an example, but the same procedure is applicable to other types of mobiles.

FIGURE 2-38. *Towfish Offsets and Measurements*



Devices carried by a towfish are configured in the same manner as if they were on a survey boat. Offsets for the *devices on your towfish* should be relative to the attachment point of the cable to the towfish.

HYPACK® uses the towfish depth, Z-offset and corrected cable length to calculate the horizontal distance from the A-frame connection point to the towfish. That distance is added to the Y-offset to calculate the layback.

A cable counter device driver is used to calculate the corrected cable out. Additional information in the driver setup completes the formula to calculate a position for your towfish.

More Information

- "Mobile Offsets" on page 2-232
- "Real Time Towfish Altitude" on page 2-236
- "Towfish with TrackPoint Systems" on page 2-238
- "Dredge Configurations" on page 2-241

TOWCABLE DEVICE SETUP IN HYPACK® HARDWARE

1. **Load the HYPACK's towcable driver as one of the devices in your hardware setup keeping the following in mind:**
   - **X, Y and Z offsets are specified in the driver setup dialog**, *not* in the device tab of HYPACK® HARDWARE.
   - **If you have an automatic cable counter, use the connect settings** to specify the communication parameters. Check the documentation from the manufacturer of your device for the proper settings.

   (Refer to the Towcable Driver Document or contact HYPACK, Inc. Technical Support for detailed instructions about the setup options.)
2. **Create the towfish as a mobile**. Click the "Add a New Mobile" phrase and type in a name for your mobile. This name will be used to identify the mobile in both the HARDWARE and the SURVEY programs.
3. **Assign the devices to their vessels.** Do the following for each device.
   a. Select the device in your device list.
   b. Indicate the device on which the device is mounted in the 'Installed on' list on the Device tab.

FIGURE 2-39. *Basic Mode -- Assigning Devices to Your Mobile*

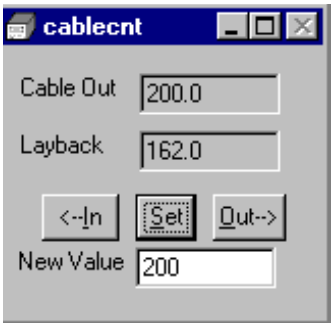
4. If you use other hardware configurations for the same survey area, **save this configuration** by selecting FILE-SAVE AS and naming the configuration. The information will be saved with an .INI extension to your project directory.

Specifying Cable Out in Survey

When you enter SURVEY, the cable count dialog will appear for you to enter your cable length (or it will display the readings from those devices that automatically output that distance). The units of this measurement should agree with the survey units.

- **If you selected 'manual mode' in the device setup**, enter your new value and click [Set]. You may adjust the cable length using [In] and [Out] to change the current cable out value by 1 distance unit.

FIGURE 2-40. *Specifying the Cable Out in the TOWCABLE.DLL Device Driver*



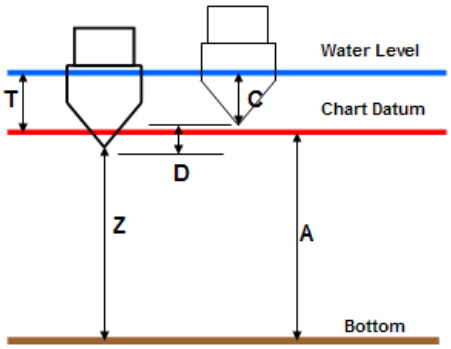
- **If you have selected one of the devices under Input Type in the setup**, the device will send your cable count value automatically. In either case, HYPACK® will calculate the layback.

In the example, we have specified the cable out as 200. Once you have specified the Cable Out, click [Set]. The program will calculate the layback, using a NOAA concatenation formula.

Real Time Towfish Altitude

HYPACK® can also calculate and record the vessel altitude above the bottom.

FIGURE 2-41. *Real Time Altitude Calculations*



The Alt3dtv driver calculates the altitude using the following equation:

Z = A – (T + D + C)

Where:Z = Real Time Altitude

A = Z-Value of MTX or TIN

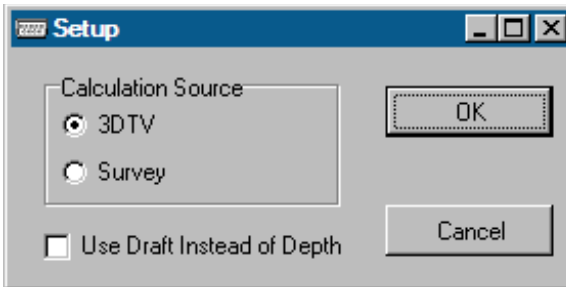
T = Tide Correction from SURVEY

D = Draft Correction from SURVEY

C = Keel Offset.

The driver can work either with SURVEY or 3DTV to get the corrected depth value (A) and the keel offset (C). This option is set in the Alt3DTV driver setup.

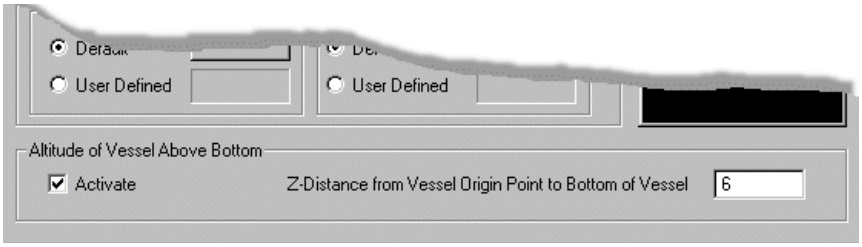
FIGURE 2-42. *Alt3DTV.dll Driver Setup*



The depth and keel offset values are read from different sources, depending on the calculation source.

Calculation Source	Depth (A) read from	Keel Offset (C) from
3DTV	TIN Model in 3DTV	3DTV Multivessel Settings Dialog: Activate the Altitude setting and define the keel offset in the Z-Distance field.
SURVEY	Filled Matrix/Matrices	Vertical Offset in the Alt3DTV driver setup.

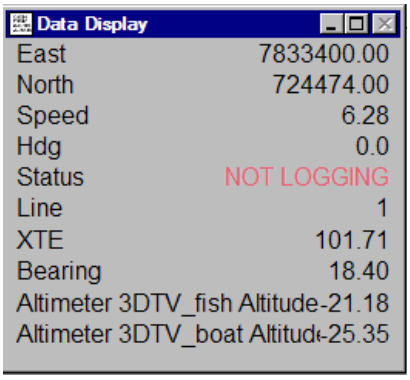
FIGURE 2-43. *Setting 3DTV to Calculate Altitude in the Multivessel Settings Dialog*



The '**Use Draft Instead of Depth**' option is included to simplify simulations.

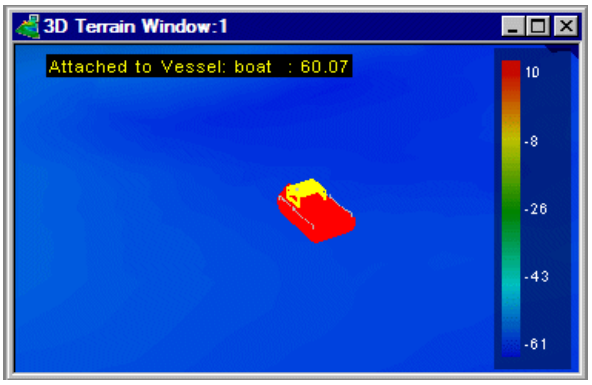
SURVEY displays the altitude in the Alt3DTV device window and in the data display.

FIGURE 2-44. *Vessel Altitude displayed in Survey's Data Display*



3D TERRAIN VIEWER displays the altitude in the upper-left corner of the Terrain Window and displays the vessel to which the driver is assigned in the correct vertical position.

FIGURE 2-45. *Vessel Altitude is displayed in the Terrain Window*



To record this data, use the Shared Memory Output program to output X, Y, Altitude data to a file.

More Information

- "Shared Memory Output Program" on page 3-22

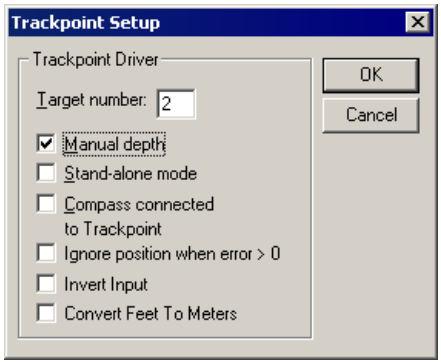
TOWFISH WITH TRACKPOINT SYSTEMS

The SURVEY program can track a single beacon from a TrackPoint system configured to output the EC2 format (Error Correction Version 2).

The TRACKPOINT system uses the TrackP.DLL.

1. **Configure the TrackP.dll**.
   a. **Driver Setup:**

FIGURE 2-46. *TrackPoint Driver Setup in HARDWARE*



The **Target Number** is the beacon number, which will be tracked on the screen. The current version of HYPACK® supports only a single beacon from the TrackPoint system, however you may install the Trackpoint.dll multiple times, each to a different COM port and Target Number, to track up to 10 devices.

Manual Depth is used to improve the position computation. If this value is checked the program will pass the depth information from the SURVEY program to the TrackPoint system. It works best if the depth is determined from a pressure transducer on the ROV. The depth device must be set up as a separate device in the HARDWARE program.

Stand-Alone Mode is only used for dockside testing and should not be used for survey purposes.

Compass Connected to Trackpoint tells the program that the bearing received from the TrackPoint is already corrected with the boat heading. This should be checked "On" in most cases. If you cannot connect your gyro to the TrackPoint system, HYPACK® will use the heading of your vessel to correct the bearing received from the TrackPoint.

Ignore Position When Error>0 is still under development. The idea is that it will give you the option to accept or reject questionable sounding data. Certain readings are coded by the TrackPoint system as questionably accurate. Checking this box rejects suspect data from being saved.

Invert Input reverses the sign of the depth values.

b. **Offsets:** Forward and Starboard Offsets indicate the relative position of the TrackPoint device from the boat origin.

Beware!

BEWARE! T*hese signs are reversed from the normal offsets*. Distances port and forward of the origin are negative. Distances starboard and aft of the origin are positive.

2. **Create a new mobile and assign the Trackpoint.dll to the mobile**.

More Information

- “Mobile Offsets” on page 2-232

Monitoring Multiple Vessels with Wireless Connection

Some of our users have multiple vessels collecting data independently at different locations in their project area. They requested methods to monitor data from all of them on one central computer via radio modems. HYPACK® can monitor position, heading and depth data using the Pitcher.dll.

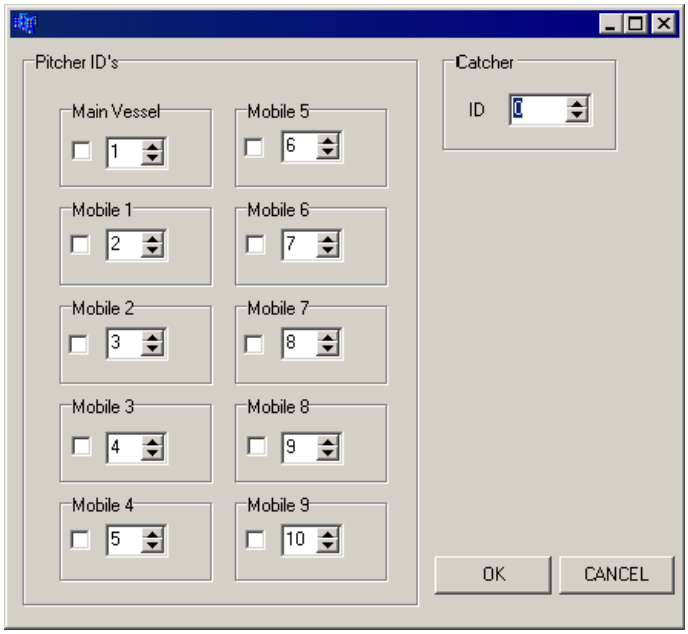
The Pitcher.dll, acting as the server, outputs position, heading and tide corrected depth data, and, acting as the client, receives the data at the monitoring computer. The configuration of this driver is very simple, if you remember just a few things.

- Both computers must be licensed HYPACK® computers.
- The Connections settings should be set as Serial Port with a baud rate equal to that of your radio modem.
- The port number of the broadcast computer must match the port number of the receiving computer.
- The receiving computer must have a separate serial connection and modem for each vessel monitored.

If you have a vessel with associated mobiles such as a dredge with multiple drag arms, one pitcher driver can be configured to output data from each of those mobiles. The receiving computer must still, however, have one pitcher driver and modem for each mobile.

The setup in SURVEY allows you to select data for each mobile associated with one vessel to be broadcast by checking the appropriate check box. Each mobile will be identified by the number in the drop-down box. In most cases, the default ID number will suffice, however, if the receiving Pitcher driver is receiving data from multiple *unassociated* vessels, the ID numbers must be modified to eliminate duplicate ID's.

FIGURE 2-47. *Pitcher Driver Setup*



For example, suppose you are working in a large dredging project. There are two dredges, each with two drag arms. The project manager wants to monitor their work from the comfort of his air conditioned office on shore. In this case, each dredge would use one pitcher driver to output data for their platform and each drag arm—three mobiles each with their own ID. If both vessels retained the default ID numbers, the receiving computer could receive two data streams from two vessels, each with IDs of 1, 2 and 3. It is not smart enough to differentiate Mobile 1 at port 1 from Mobile 1 at port 2 so we adjust the settings in one Pitcher driver to output using different ID numbers (4, 5 and 6 for example).

The manager's hardware configuration includes a Pitcher driver *for each mobile*. In this example, there would be six instances. Each device window would then be adjusted to read a different ID number using the Catcher scroll box.

When targets are created by any of the mobiles:

- The coordinates will appear in all of the Pitcher windows.
- Targets will be drawn in the Map window of the Manager's computer.
- Targets will be drawn in the Map window on the survey computer of the vessel that created the target.

DREDGE CONFIGURATIONS

Dredge configurations vary widely depending on the type of dredge and the devices in use. Your HYPACK® install includes sample hardware configurations for each basic dredge type. These may be found in the

\Hypack\Sample Setups folder. They are meant only to start you on your way. *You will need to modify them to match your devices and measurements*.

Dredge cutting tools are configured in the same manner as additional mobiles. For each cutting tool, add a mobile and assign to it the driver required to report its position to DREDGEPACK®. Precise measurements of offsets and arm or ladder lengths are essential to assure accurate positioning of your mobiles including your cutting tool.

Beware!

BEWARE! When the position of a mobile is calculated *relative to another mobile, the horizontal offset signs are reversed from the normal convention* (ie distances port and forward of the origin are negative and distances starboard and aft of the origin are positive).

CUTTER SUCTION DREDGE CONFIGURATION

Cutter suction configurations must generate data for the dredge position and heading, and for the cutter head position and depth.

FIGURE 2-48. *Cutter Suction Dredge Diagram*

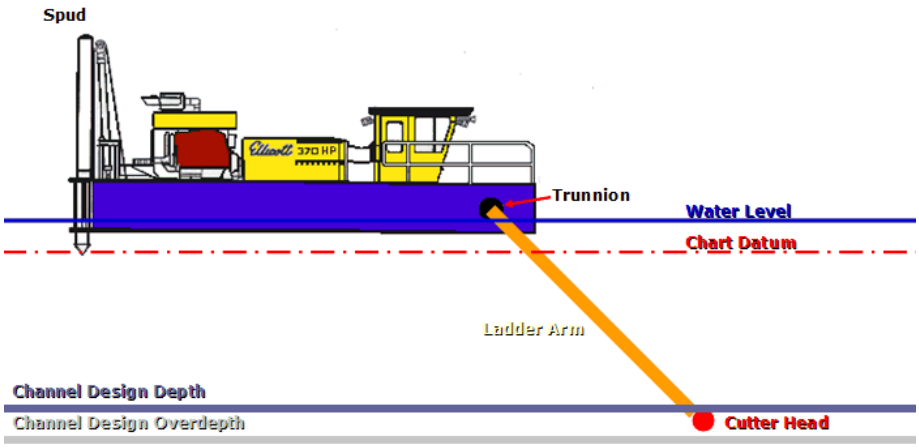


TABLE 2-8. *Sample Cutter Suction Dredge Driver List*

Data	Driver	Assigned to
Dredge Position	GPS.dll	Boat
Dredge Orientation	Any Heading system	Boat

Data	Driver	Assigned to
Cutter Head Position and Depth	Inclinometer.dll - several brands are built into the driver. Also includes manual configuration. OR Bubblers.dll (or other bubbler driver) for bubbler systems.	Arm
Cutter Display Graphics (Optional)	Cutter.dll	Arm

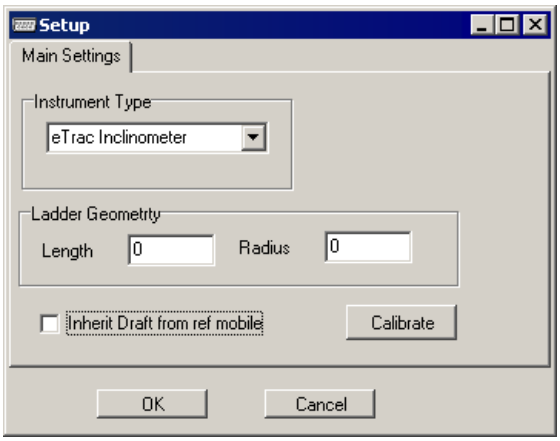
The Dredge: The dredge position is the same as a simple survey boat with one exception. The origin will be the trunnion position at the height of the static water line as your dredge origin.

An 'Orientation GPS' system, like the CSI Wireless Vector, provides both position and heading without the need of a gyro.

NOTE Fluxgate compasses do not work well on dredges.

The Cutting Tool: The cutting tool is configured as a second mobile. The inclinometer driver uses a ladder length from the setup and the angle it measures to calculate the depth and position of the cutter head.

FIGURE 2-49. *Inclinometer.dll Driver Setup Dialog*



A short calibration routine assures accurate returns. While the setup dialog is open, set the cutter head on the waterline and click [Calibrate]. The driver calculates its depths using that height as 0.

Optional Settings: The **Ladder Arm** may also be a separate mobile. This allows you to use the cutter driver to support more realistic graphics in its device window. Sample shape files for those required by this driver are included in your install in the \Hypack\BoatShapes\Shapes for the Cutter folder. The driver will automatically adjust the scale to convert the dimensions in the

shape file to the real-world sizes specified in this dialog. The results are seen in the Cutter Device window. This driver should be assigned to the arm that is designated as the main vessel.

FIGURE 2-50. *Sample Cutter.dll Driver Setup*

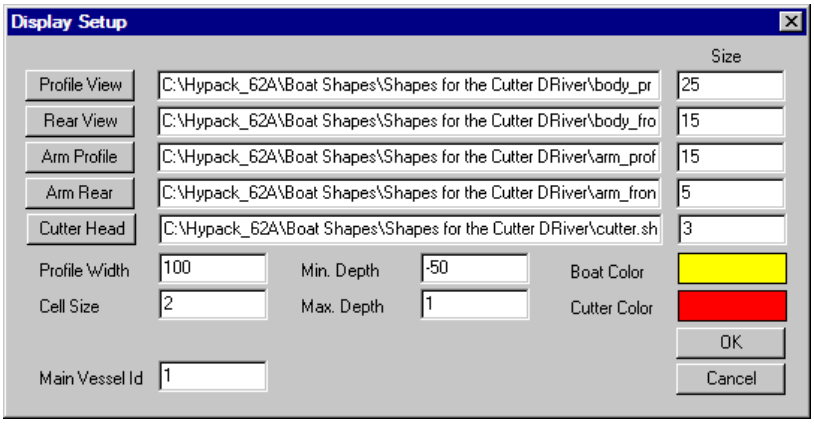
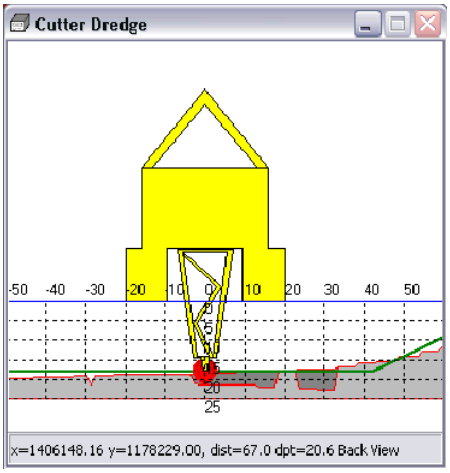


FIGURE 2-51. *Sample Cutter Driver Device Window*



The **Spud Position** can be configured as an additional mobile. This would be only for the sake of realism in 3DTV; it has no bearing on data collection. The position would be calculated using the GenOffset or Sim_rel driver.

HOPPER DREDGE HARDWARE CONFIGURATION

Hopper dredge configurations must generate data for:

- the dredge position and heading,
- the cutter head position and depth.

Draft sensors should also be included to measure the significant change in draft as the load on your dredge increases.

FIGURE 2-52. Hopper Dredge Diagram

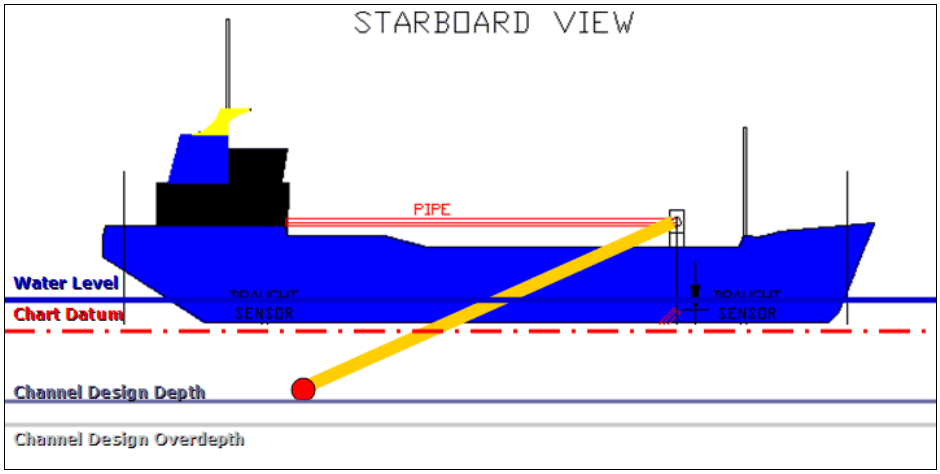


TABLE 2-9. Sample Hopper Dredge Driver List.

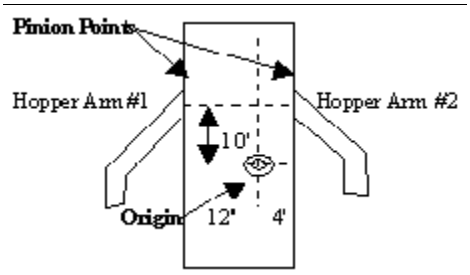
Data	Driver	Assigned to
Dredge Position	GPS.dll (either DGPS or RTK)	Boat
Dredge Orientation	Any Heading system	Boat
Draft	Bubbler.dll (Pressure Transducers)	Boat
Hopper Position and Depth	Pressure Sensor or Bubbler— OPC Network	Arm
Hopper Display Graphics (Optional)	Hopper.dll	Boat

Each drag arm must be configured as a separate mobile, each with its own driver. Most hopper dredges report their information via various OPC configurations. This requires a custom driver for each hopper dredge.

The Hopper driver, combined with boat shape files (*.SHP) representing the profile and rear views of the dredge and the cutter head, can be used to create detailed displays in the Hopper driver device window.

When dredges have more than one hopper arm, there will be multiple incidents of the device driver. The Forward and Starboard Offsets indicate the relative position of the pinion points from the boat origin.

FIGURE 2-53. *Hopper Dredge Diagram*



Devices	Offset Dialogs
Hopper Arm #1	X-Offset = -12 Y-Offset = -10
Hopper Arm #2	X-Offset = 4 Y-Offset = -10

FIGURE 2-54. *Hopper Driver Setup*

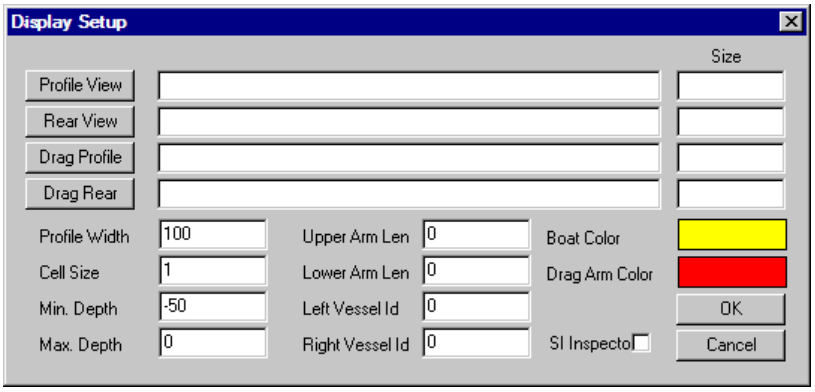
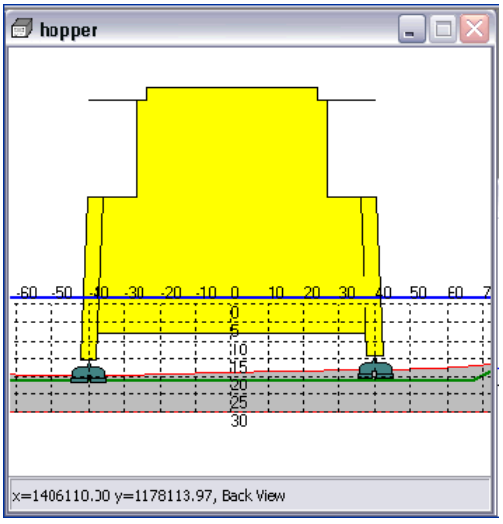


FIGURE 2-55. *Sample Hopper Driver Device Window*



EXCAVATOR DREDGE HARDWARE CONFIGURATION

Excavator configurations must generate data for the excavator cab position and heading, and an inclinometer for each joint in the arm—cab to boom, boom to stick, stick to bucket. The barge position is optional.

TABLE 2-10. *Sample Excavator Driver List.*

Data	Driver	Assigned to
Cab Position	GPS.dll	
Cab Orientation	Any Heading system	Boat
Bucket Position and Depth	Excavparser.dll	Excavator
Bucket Position and Depth reporting to DREDGEPACK®	Excavsm.dll	Excavator
Barge Position (optional)	GPS.dll using OTFGyro option	Barge

The **Excavparser** driver reads values for all three angles, and calculates the correct positions for the arm and bucket. This driver supports multiple angle sensors. Select your sensor type at the top of the dialog. The remaining setup options will change according to the sensor type.

FIGURE 2-56. *ExcavParser Driver Setup*

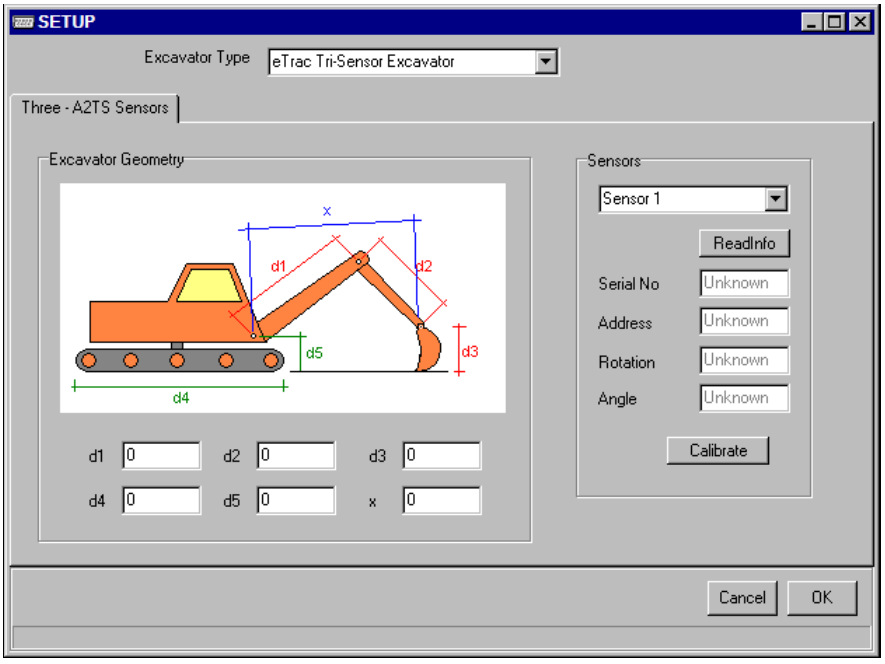
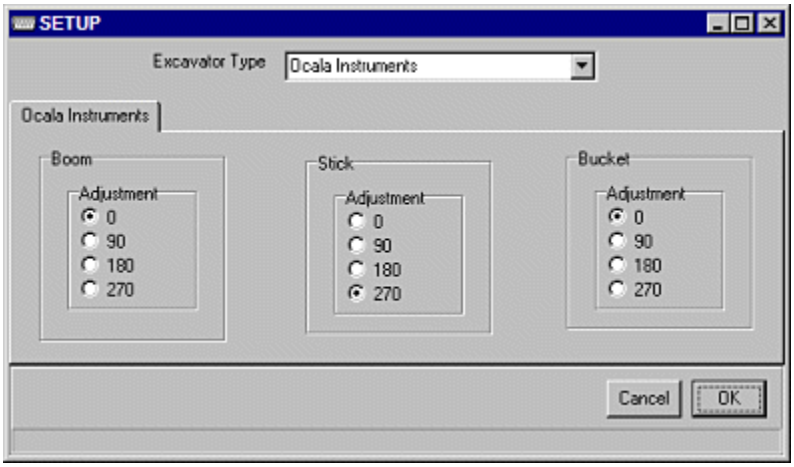
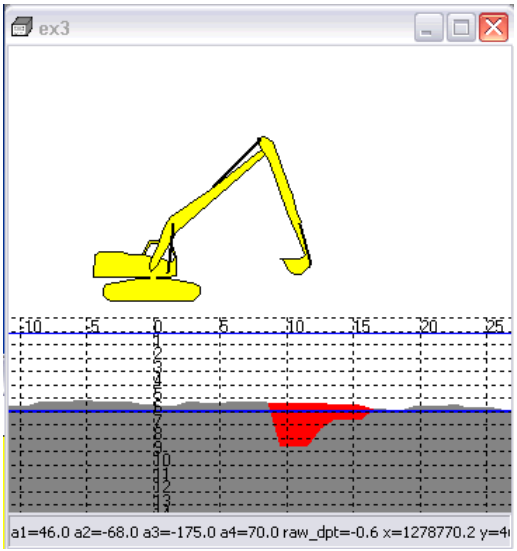


FIGURE 2-57. *ExcavParser Driver Setup*



The **Excavsm driver** reads data compiled by the Excavparse driver, does the required calculations, then stores the data to shared memory and provides a real-time graphical display of your excavator relative to your matrix and channel depths.

FIGURE 2-58. *Sample Excavator Device Window*



The barge position is for display purposes only. Usin g the OTFGyro option in the GPS driver, you can position the barge in your area map.

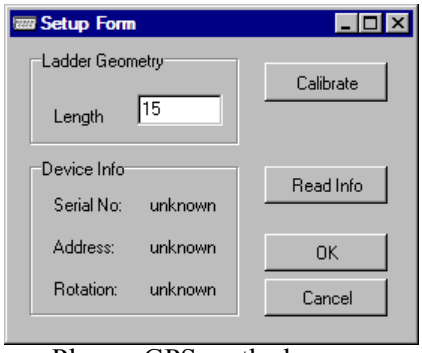
BUCKET DREDGE HARDWARE CONFIGURATION

Bucket dredges may be configured in either of two ways:

- Get the Position and Heading of the cab then calculate the position of the boom using cable length from the LCI90 driver and, if you vary your boom height, angle data from an inclinometer.

Data	Driver	Assigned to
Cab Position	GPS.dll (either DGPS or RTK)	Boat
Cab Heading	Any Heading system	Boat
Bucket Position and Depth	A2ts.dll – for variable boom heights LCI90.dll – for cable out	Bucket
Barge Position	RelHdg.dll provides barge position relative to the position of the cab.	Barge

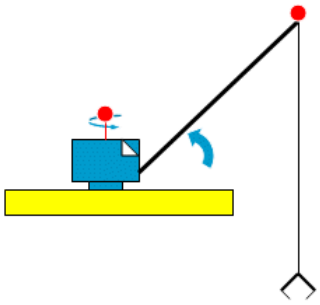
FIGURE 2-59. *A2TS Driver Setup Dialog*



- Place a GPS on the boom.

Data	Driver	Assigned to
Bucket Position and Depth	GPS.dll (RTK)	Bucket (Boat if cab omitted)
Cab Position (optional)	GPS.dll (DGPS or RTK)	Boat
Cab Heading (optional)	Any Heading system	Boat

FIGURE 2-60. *Sample Bucket Dredge*



Beware!

BEWARE! Accurate bucket depths are very difficult to attain. A post-dredge survey is required to measure final channel contours.

MONITORING SURVEY OVER THE NETWORK WITH THE WEBIF DRIVER

The Web Interface driver displays SURVEY data and provides limited controls which can be accessed from a network computer in your web browser. The remote computer can be on the local area network or the wide area network.

On the survey computer:

1. **Include the WebIF.dll in your hardware configuration,** assigning it to the mobile that you want to monitor.
2. **If you want to view the SURVEY interface over the wide area network, access the router setup and open the proper port to allow incoming communication.** Typically it is the default gateway address when you are in the command prompt. By default the port is 8080.

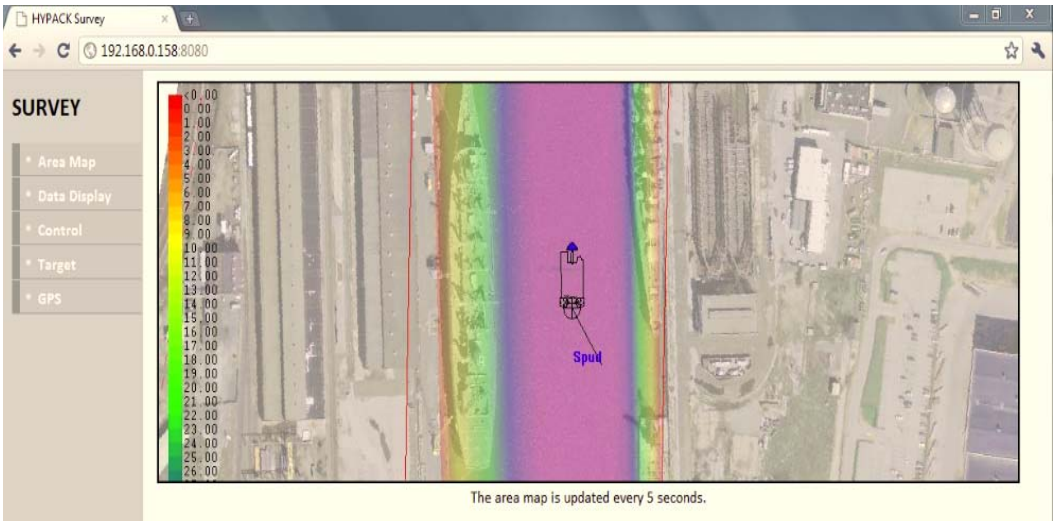
On the remote computer (where you want to do the viewing):

3. **Open your favorite browser**. I choose Google Chrome for my tests.
4. **Enter your IP address along with the Port number in the address bar.** EX: 192.168.1.1:8080.

There will be 5 interface windows that you can view in your remote browser window.

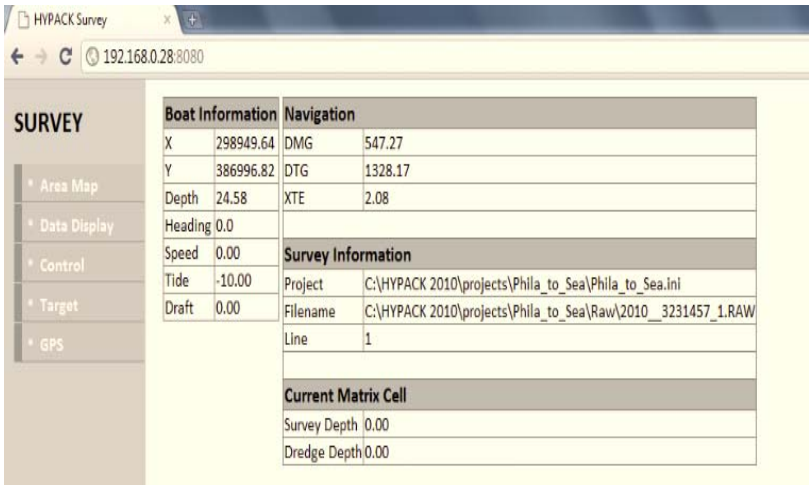
- The **Area Map** display updates every 5 seconds.

FIGURE 2-61. *Area Map*



- The **Data Display** shows a specific set of survey information: Boat X/Y, DMG, DTG, XTE, Depths, Survey File Info and Current Matrix Cell Data Display. It is not configurable.

FIGURE 2-62. *Data Display*

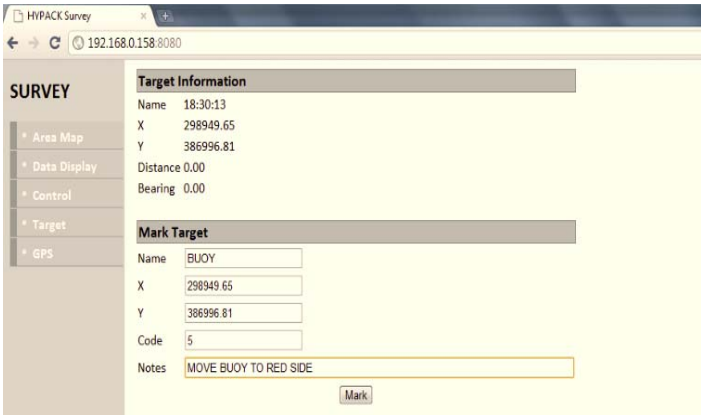


- The **Control tab** provides limited logging and line selection controls that are also available in SURVEY.

FIGURE 2-63. *WebIF Interface*

- In the **Targets tab**, mark targets over the network. Just enter the required information and click [Mark].

FIGURE 2-64. *Targets*



The GPS tab displays specific GPS-related information. It is not configurable.

FIGURE 2-65. *GPS Information – Displays Information About the GPS*

More Information

- “Broadcasting Survey Windows over the Network to the Survey Viewer” on page 3-18
- “Shared Memory Programs” on page 3-20

AUTOMATED IDENTIFICATION SYSTEM

The Automated Identification System (AIS) is used to track other vessels in your area that are broadcasting the AIS signal. This requires and AIS receiver and the AIS.dll in your hardware configuration.

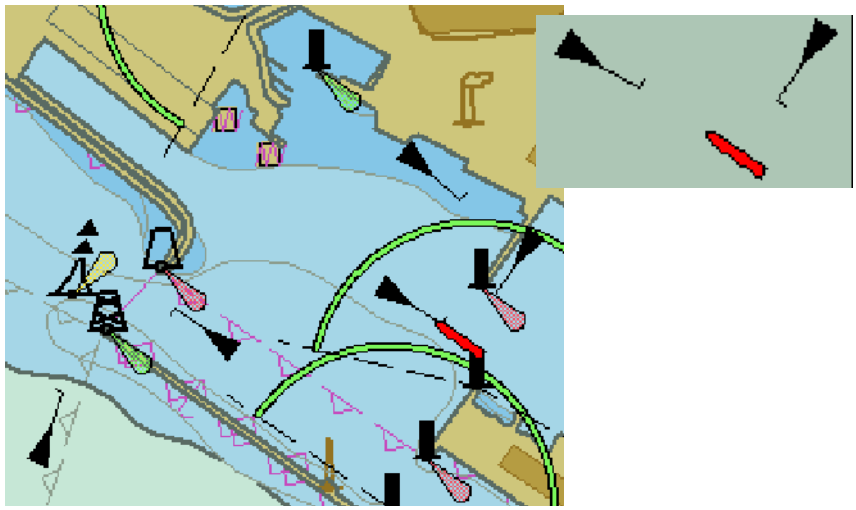
The AIS receiver is a standard serial device that receives AIS signals from other vessels within radio range. HYPACK® SURVEY uses this data to display one symbol for each vessel.

In the following figures, the red boat shape is your HYPACK® vessel. The other vessel symbols are displayed according to information from the AIS system and in compliance with IMO standards. At this writing,

HYPACK® reads basic position and heading information from AIS broadcasts. (The capability to read additional ship information is in development.)

You can **activate/deactivate individual vessels** in this display by right-clicking on the vessel and selecting the 'Activate' option.

FIGURE 2-66. *SURVEY displays symbols according to vessel information received through the AIS receiver.*



The device setup for the AIS.dll requires only the AIS receiver function and the correct serial connection settings. Offsets are unnecessary as this driver is reporting, rather than calculating position information.

HYSWEEP® HARDWARE SETUP IN HYPACK®

HYSWEEP® SURVEY takes over collection of the high-speed devices. The HYPACK® SURVEY program does not require a driver to send data to HYSWEEP® SURVEY; it is done automatically through the shared memory mechanism.

A HYSWEEP® Interface driver (Hysweep.dll) is required for HYPACK® SURVEY to use Gyro and Heave data collected by HYSWEEP® SURVEY. Just select the HYSWEEP® driver and check Heading and Heave comp. in the Device Setup dialog. The Hysweep driver is *not* required to paint the matrix in HYPACK® SURVEY with multibeam data.

You can also use the Hysweep.dll to pass depths to HYPACK® SURVEY:

- **In multibeam projects,** it stores the nadir depth as an EC1 record.
- **In side scan projects**, it will report towfish depth as depth 1 and towfhis altitiude as depth 2.

This is done by checking Echosounder in the device setup dialog.

MATRIX FILES (*MTX)

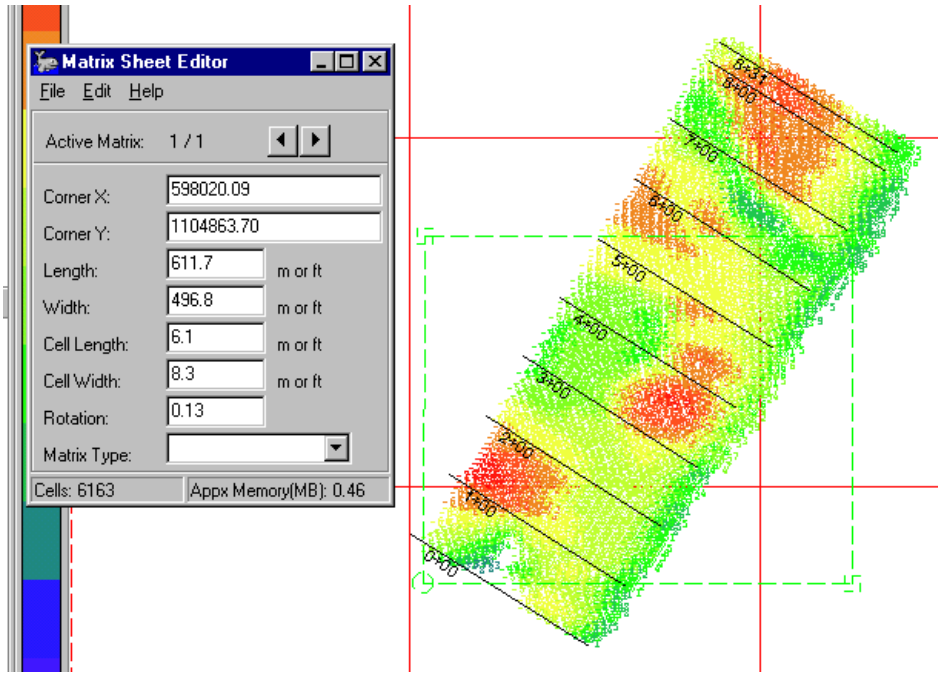
Matrix files (*MTX) are gridded rectangular areas. You can fill the cells with depth information from your echosounder or dredge cutting tool in real time during data collection, or in post-processing.

Empty Matrix files are typically created in the MATRIX EDITOR and are saved to the project directory.

CREATING A MATRIX FILE WITH THE MATRIX EDITOR

1. **Load the files that define your survey area** (ex. background files or Planned Line Files). Right-click on background files or Planned Line Files at the lower left and select Add File and follow the prompts to select your file. You may choose to zoom-in or –out to adjust the size of the area to fit your screen.
2. **Open the Matrix Editor** by selecting PREPARATION-EDITORS-MATRIX. A default Matrix will be drawn to the screen and defined in the Matrix Editor dialog.

FIGURE 2-1. *The Matrix Editor*



3. **Position and size the Matrix File** to cover your survey area.
   - **With the cursor, drag the corners** in the HYPACK® map window.
     - **To move the matrix file**, click and drag the circled corner .

- **To rotate the matrix file**, click and drag the square corner opposite the circled corner .
- **To change the length of your matrix area**, click and drag the first square corner counter-clockwise from the circled corner .
- **To change the width of your matrix area**, click and drag the first square corner clockwise from the circled corner .

- **In the MATRIX EDITOR**, edit the length, width and rotation information displayed.

  The X-Y coordinates represent the position of the circled corner of the matrix file. All other information is relative to that point.

  As each change is entered in the MATRIX EDITOR, the drawing in the Area Map will be updated accordingly.

4. **Define the cell length and width** to set the size of the individual cells inside the matrix. The number of cells and approximate memory required for this matrix is displayed in the status bar.
5. **Choose the Type of matrix.**
   - **For single beam data** in SURVEY, choose the HYPACK® type.
   - **For multibeam data i**n HYSWEEP® SURVEY, use the HYSWEEP® type. If you are collecting both single beam and multibeam data types, only one type can be painted to the matrix during your survey. Choose which data type is painted by choosing the corresponding matrix type.

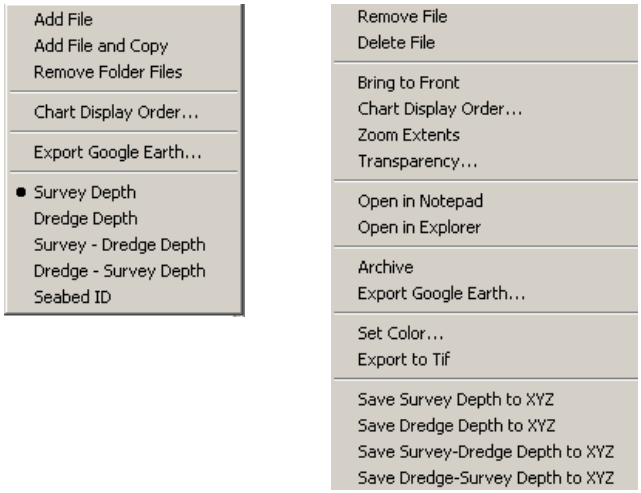
     NOTE The other data type can be saved to a matrix file during post-processing using MAPPER or the HYSWEEP® EDITOR.

   - **For dredging projects,** choose the HYPACK® type.
6. **Save your Matrix File** by selecting FILE-SAVE. You will be asked to name your file. It will be saved to your project directory with the MTX extension and will be enabled in your project. You now have a blank (not filled) matrix!

MATRIX FILE VIEW OPTIONS IN HYPACK®

Matrix files can store two depths in each cell--the “As Surveyed” depth and the “As Dredged” depth. The displayed depth is determined by right-clicking on the “Matrix Files” label in the Project Files list on the left of the HYPACK® screen. A pop-up menu will appear.

FIGURE 2-2. *Matrix Right-click Menus: From Matrix Folder (left) and Matrix File (right)*



Here you can choose to display either of these depths or the difference between them.

Typically, you will display the survey depth in survey projects.

Dredge projects are usually configured to show either the dredge depth or the difference between survey and dredge depths. This will depend on the specifications of your project and, at times, on personal preference in configuring the project.

In TIN MODEL, you can export a matrix filled with seabed identification information. A seabed-type matrix stores the seabed identification information in the Survey Depth memory of the output matrix and depth information in the Dredge Depth memory.

To display your data using seabed identification colors:

1. **In SEABED STATISTICS or SEABED MAPPER, export your data to XYZId format**.
2. **In SEABED STATISTICS, export the seabed ID colors to a HYPACK® Color file (*.HCF)**.
3. **In HYPACK®, load the Seabed HCF file as your project color file**.
4. **In HYPACK®, set the matrix to display either Survey Depths or Seabed ID**. Either will work.
5. **In TIN MODEL, TIN your seabed ID values by using your XYZId file as the input file**.

Since you have loaded your seabed colors as your project colors, your color TIN models should draw in seabed colors. Likewise, if you export

your TIN data and display it in the HYPACK® map, it will be color-coded according to your seabed colors.

More Information

- “Seabed Identification in Mapper” on page 4-68
- “Seabed Statistics” on page 8-182
- “Sounding Color Settings in HYPACK®” on page 1-34

Filling a Matrix File with Sounding Data

Matrix files are used in dredging operations to guide the dredge operators they work. By filling a matrix with pre-dredge survey data, the operator can easily see the areas that require excavation. As they dredge using DREDGEPACK®, the matrix can be updated with depths recorded at the digging tool. In this way, the operator can also see where digging has occurred and what depths they have reached.

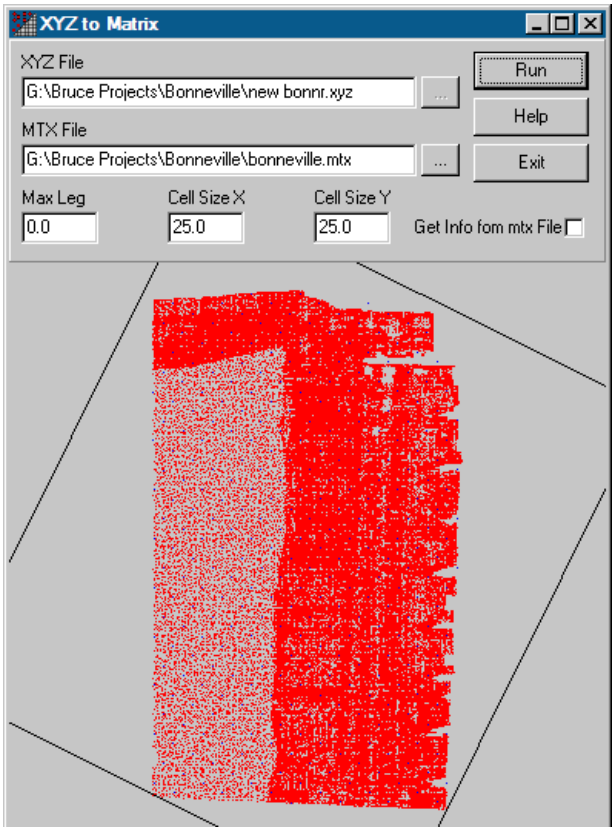
If the pre-dredge survey was performed with HYPACK® there may already be a matrix filled with survey data ready for the dredge. If the surveyors did not store data to a matrix during the pre-dredge survey, there are other methods to prepare such a "filled" matrix.

Filling a Matrix with Soundings in the XYZ to Matrix Program

XYZ TO MTX and TIN MODEL are the most useful methods for filling matrices as they interpolate data to cover areas where your data is sparse or non-existent. They can therefore create a fully filled, yet quite accurate HYPACK-type matrix file to guide your dredge project. XYZ TO MTX is easier for simply filling matrix files and creates the same results.

1. **Start the XYZ TO MTX program** by either clicking on the icon or clicking UTILITIES-OTHER-XYZ TO MTX .

FIGURE 2-3. *XYZ to MTX Transformation dialog*



2. **Fill in all of the fields**.
   a. **Enter the XYZ or XYZ-date file** you wish to convert. ([Browse] makes it a snap!)
   b. **Enter the path and name for your new matrix file**.
   c. **Max Leg** specifies the maximum distance used to connect to XYZ data points. This value must be a positive value. You should set this large enough so your data points connect, but not so large that points which have little relationship connect to each other. The value of this field depends on the density of the input data. If the value is too small, the final result will be incomplete. If the value is too large, the creation will be slow.
   d. **Matrix Size** fields define the cell size within the Matrix to be created. Alternatively, you can check the **Get Info from MTX File** to use the matrix and cell size from the matrix entered in the MTX File field.

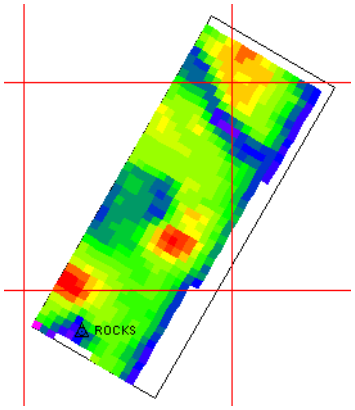
Beware!

BEWARE! The **Get Info from MTX File** requires any data in the existing matrix will be overwritten.

3. **Click [Run].** The program generates a surface model and then calculates the Matrix size and rotation to fit the data. It then fills the matrix cells with the depth nearest the center of each cell calculated from the surface model.

A small representation of the results is drawn to the lower part of the dialog. You may also view the results by loading the Matrix file to the HYPACK® screen.

FIGURE 2-4. *The resulting Matrix displayed in the main window*

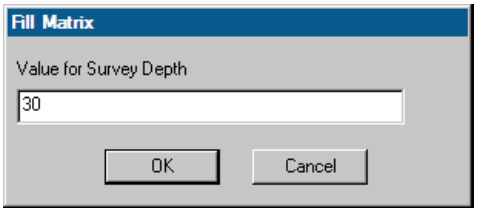


FILLING A MATRIX WITH UNIFORM DEPTH

In some cases, you may want to begin with a filled matrix file, but you have no survey data with which to fill one. The MATRIX EDITOR provides a method of filling a matrix with a uniform, user-defined depth.

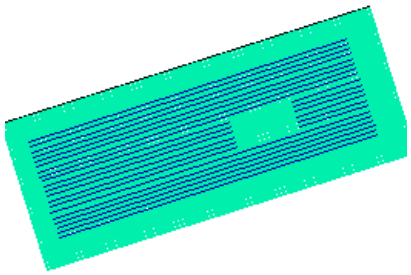
1. **Create an empty matrix file** in the MATRIX EDITOR. Include cell size and matrix rotation.
2. **Select FILE-SAVE FILLED MATRIX**. A Windows® Save As dialog will appear for you to name your file.
3. **Name your new matrix file and click [OK].** The Fill Matrix dialog will appear.

FIGURE 2-5. *Fill Matrix Dialog*



4. **Enter the depth** with which you want to fill the matrix and click [OK] and the new matrix will be drawn to the HYPACK® Map.

FIGURE 2-6. *Fill Matrix Results—Filled Matrix overlaid with Planned Lines*



EXTRACTING SOUNDING DATA FROM YOUR MATRIX

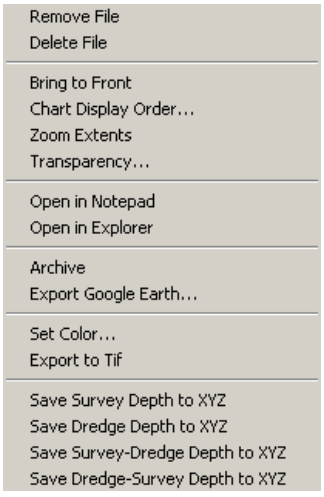
If you have a filled matrix file, you can extract the depths represented in it to an XYZ data file. This data can be used to create models and contours in TIN MODEL, plotted in HYPLOT and displayed in HYPACK®. It can also be exported to third party programs.

You could use your matrix to build a TIN model then export an XYZ file. If your matrix was a post-dredge matrix, this method could only extract the survey depths; it can not extract the dredge depths.

HYPACK® includes a simpler tool that can extract the survey depths, dredge depths or the difference betwen the two depth values with less work. It is tucked away in the right-click menu of matrix files in HYPACK®.

1. **Right-click on the filled matrix file in your Project Files list.** A pop-up menu will appear.

FIGURE 2-7. *Matrix Right-click Menu*



2. **Choose a save option.** You can save either the survey depths, the dredge depths or the difference of the two values to XYZ format. A File Save dialog will appear.

3. **Name your file and click [Save].** The program saves one sounding value for each cell in your matrix and saves it, by default, to your Sort directory.

EDITING AN EXISTING MATRIX FILE

You can make changes to an existing Matrix file in the MATRIX EDITOR. The changes can be saved to the original file name (overwriting it), or saved to a new file name.

1. **Load the Matrix file to the MATRIX EDITOR.** You can do this by:
   - Double-clicking on the file name in the Project Files List.
   - Selecting FILE-OPEN from the MATRIX EDITOR menu and selecting the file you want to change.
2. **To edit the matrix file**, you can click and drag the corners to move, rotate or resize the matrix. You can also go to the MATRIX EDITOR and change cell dimensions as well as the positioning of the matrix area. The changes are reflected in the area map as they are entered.

   BEWARE! If you edit a "filled" matrix file, it will *lose its depth content.*

Beware!

3. **When you are satisfied, save your file.** Click on either FILE-SAVE or FILE-SAVE AS. If you select SAVE, it will overwrite the original matrix information with a new "blank" matrix. If you use SAVE AS, it will ask you for a new file name and create a new "blank" matrix using that name. The HYPACK® screen display will reflect your work.

TARGET FILES (*TGT)

Target Files (*.TGT) contain name and position information for a series of objects. You can create a target file manually, using the TARGET EDITOR then import it into the SURVEY program. This enables you to navigate *to* pre-determined locationsor *away* from areas dangerous for navigation. You can also mark targets at points of interest in SURVEY or DREDGEPACK® and save them to a target file.

They can be displayed in the 3D Terrain Viewer, plotted in the HYPLOT program and exported to DXF or DGN formats using EXPORT.

Target display settings are defined in the HYPACK® control panel and in SURVEY and DREDGEPACK® through the target properties and parameters.

CREATING A NEW TARGET FILE

The TARGET EDITOR program is used to manually enter information into a Target Files (*.TGT).

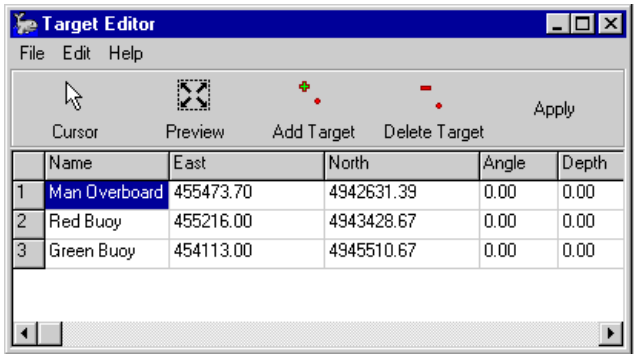
1. **If you have files that define your survey area** (ex. background files or Planned Line Files**), load them**. Right-click on background files or Planned Line Files at the lower left and select Add File and follow the prompts to select your file. You may choose to zoom-in or –out to adjust the size of the area to fit your screen.
2. **Click on PREPARATION-EDITORS-TARGET**and the Target Editor will appear.
3. **Click on FILE-NEW** to clear the spreadsheet.
4. **Enter all pertinent information for each Target.** You must, at least, enter the coordinates and a name for the Target. The rest is optional. Those fields may be filled manually, but typically, they are filled when Targets are created in the SURVEY program.
   - **If you know the coordinates of your Target points**, you can type them directly into the spreadsheet or import them from an XYZ file. Click [Preview] to minimize the TARGET EDITOR and zoom in to view the Targets in the Map Window. Click on [Target Editor] at the lower left to return to the spreadsheet.

   NOTE Position information can be entered in either X,Y or Lat./Lon. format. This option is toggled using the EDIT-UNITS menu selection. Lat./Lon. displays follow the default setting found in the General Tab of the HYPACK® Control Panel.

   - **If you have loaded a Background File click [Cursor].** The TARGET EDITOR will minimize and you can left click on the

area map where you want to mark your Targets. Click on [Target Editor] at the lower left to return to the spreadsheet.

FIGURE 2-1. *The Target Editor*

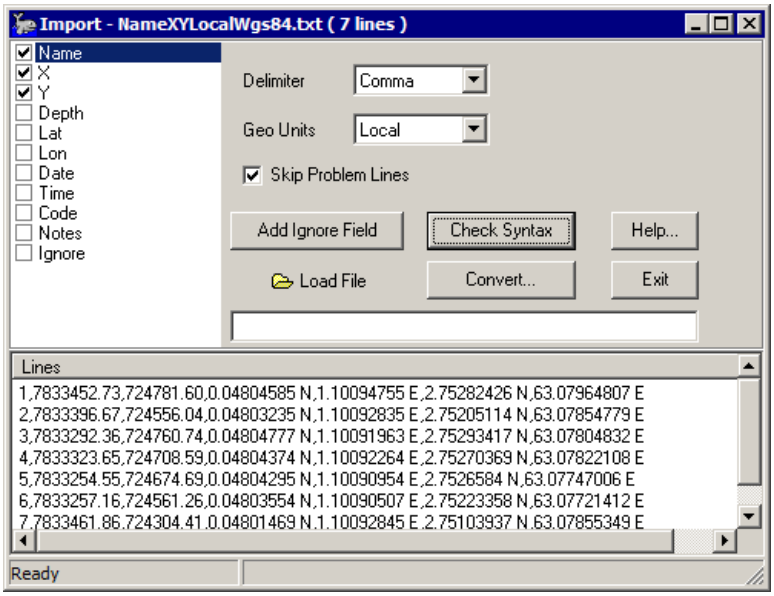


5. **Save your file**, when you are satisfied, by selecting FILE-SAVE and naming your file. Your Target File will be saved with the *.TGT extension to your project directory and will be enabled (drawn to the screen) to the project. It may be displayed in the SURVEY program.

IMPORTING TARGET POSITIONS FROM TEXT FILES

1. **Open the TARGET EDITOR** from the Editors menu in the HYPACK® shell.
2. **Select FILE-IMPORT**. This will give us the dialog box which we will use to set up our import of the text document that we created earlier.

FIGURE 2-2. *Target Import Dialog*



3. **Select and order the fields used to create your new target file.** Place a check in the box for each field in your text file you want to use to populate the target file. The fields can be dragged into the order that they appear in your file. In this example, we are importing the first three fields of each record: name and the XY positions.
4. **Choose the correct delimited format.** The program supports comma, tab and space delimiters..
5. **Load the text file.** Click [Load File], select your file and click [Open]. In the Lines area, you will see your targets as they appear in your file and you can see the syntax of the records.
6. **Check the syntax of your file against the field list.** (Optional) This process verifies that your configuration settings are compatible with the text file you have loaded.
   a. **Select a line** from the Lines area.
   b. **Click [Check Syntax]**. A message window will appear to tell you how many records of the total number can be converted using your current settings.
7. **Click [Convert]** A message window will appear to tell you how many records have been converted.
8. **Click [Exit].** The Import dialog will close and the TARGET EDITOR will be populated with the data from the text file.
9. **Save your target file** by selecting FILE-SAVE and naming your file. Your file will be saved, by default to your project folder.

EDITING AN EXISTING TARGET FILE

You can make changes to an existing Target file in the TARGET EDITOR. The changes can be saved to the original file name (overwriting it), or saved to a new file name.

1. **Load the Target file to the Target Editor.** You can do this by:
   - Double-clicking on the file name in the Project Files List
   - Selecting FILE-OPEN from the Target Editor menu and selecting the file you want to change.
2. **Modify your file.** You can edit cells individually, insert or delete a target, or append one target file to another
3. **Save your file.** FILE -SAVE will overwrite the original file. FILE-SAVE AS enables you to save your results to a new file. The changes will be reflected in the file drawn to the screen.

To insert a target:

1. **Click on the row of your file** that falls immediately after where you would like to insert your new Target.
2. **Click on EDIT-ADD TARGET**. A blank row will be appended to the list.
3. **Fill in your Target information**.
4. **Save your file**.

To delete a target:

1. **Open the Target file** in the TARGET EDITOR.
2. **Click on the Target that you wish to delete and select EDIT-DELETE TARGET**.
3. **Save your file.** FILE -SAVE will overwrite the original file. FILE-SAVE AS enables you to save your results to a new file. The changes will be reflected in the file drawn to the screen.

To append target files:

You can add the Target points from one Target File to the end of another using the FILE-APPEND feature.

1. **Open the first file** by selecting FILE-OPEN and choosing your Target File.
2. **Select FILE-APPEND** and select the second file. The points of this file will follow the points of the first in the Target Editor.
3. **Save your file**.

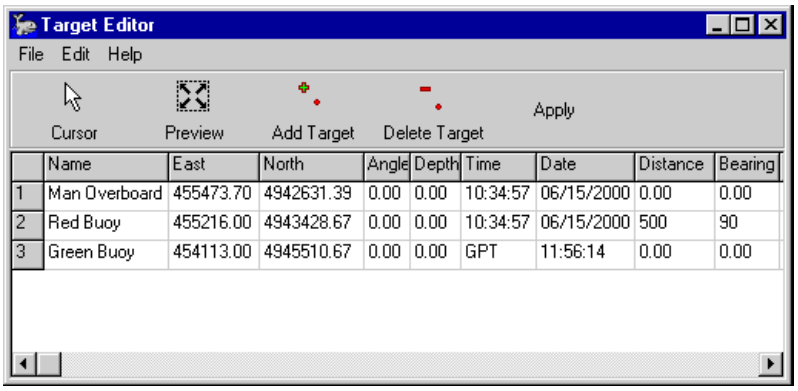
TRANSLATING TARGETS IN THE TARGET EDITOR

In SURVEY, a target is created at the position of the main vessel's tracking point. You can then offset the target *display* position from there by a user-specified distance and bearing entered in the Target Properties dialog.

You can then move the target positions to the calculated display position by selecting EDIT-TRANSLATE TARGETS. All of the targets will be relocated to their display positions and the distance and bearing properties will be reset to 0.

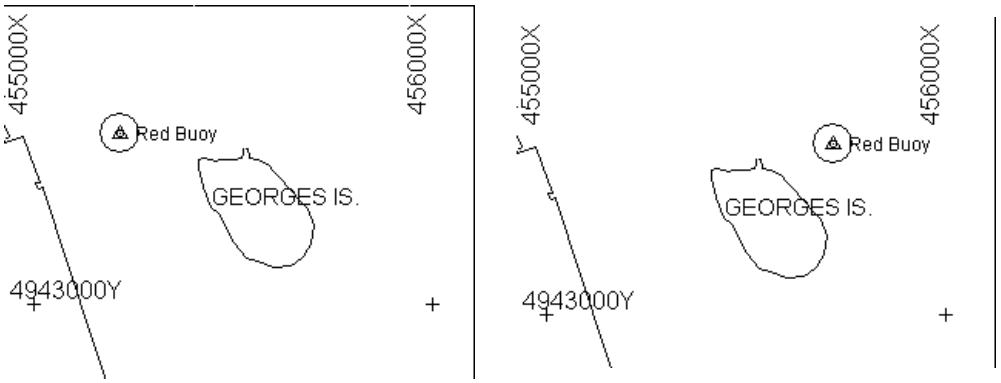
In the following example, the red target was moved 500 meters at a bearing of 90 degrees. You can see it began northwest of Georges Island and moved to a position northeast of the island.

FIGURE 2-3. *Red Target Shows Distance and Bearing Properties*



	Name	East	North	Angle	Depth	Time	Date	Distance	Bearing
1	Man Overboard	455473.70	4942631.39	0.00	0.00	10:34:57	06/15/2000	0.00	0.00
2	Red Buoy	455216.00	4943428.67	0.00	0.00	10:34:57	06/15/2000	500	90
3	Green Buoy	454113.00	4945510.67	0.00	0.00	GPT	11:56:14	0.00	0.00

FIGURE 2-4. *Translating Targets--Before (left) and After (right)*



TARGET DISPLAY OPTIONS

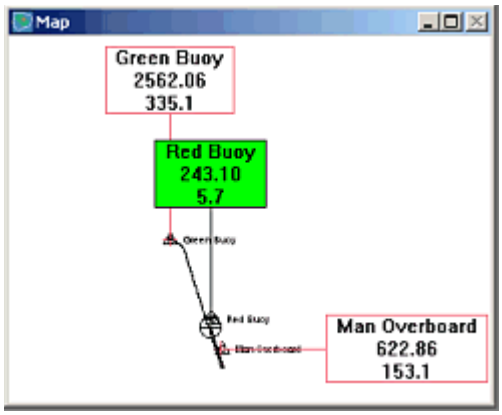
In Targets tab of the HYPACK® Control Panel, you may choose how your targets will be displayed in the HYPACK® windows.

Setting Options in the Control Panel-Targets Tab

- **Circle** draws concentric circles around the Target. In the Targets tab of the Control Panel, set the **Number of Circles** and the **Circle Radius**--the distance between the target location and the first circle and between each circle thereafter.
- **Alarm** adds a text box display for each target with the Target Name and, during SURVEY, the Distance and Bearing from the vessel's

tracking point. The text box changes color, according to the alarm distances set in the Target tab of the HYPACK® Control Panel. The default colors are green (low), yellow (medium caution) and red (danger), but you can set your own colors using the SCHEME BUILDER program. The angle at which each flag extends from the target position is based on the Angle property in the Target Properties.

FIGURE 2-5. Alarm Targets in SURVEY



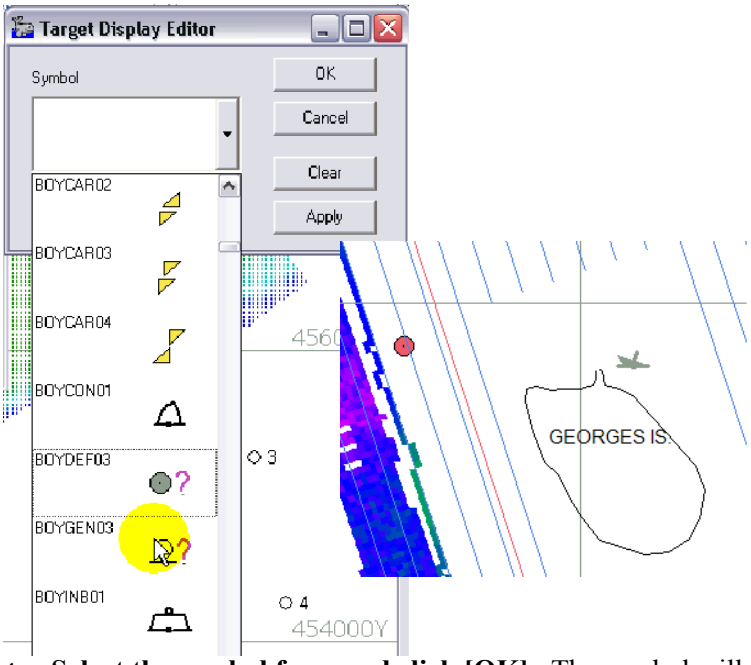
- **S57 Symbols** can also be displayed at target locations. Set the symbols in the TARGET EDITOR and the label display in the HYPACK® Control Panel.

Assigning S57 Symbols to Targets

To assign an S57 symbol to a target:

1. **Open the target file in the TARGET EDITOR.**
2. **Select the target** to which you want to assign a symbol.
3. **Click on the Display icon** and the Target Display Editor will appear.

FIGURE 2-6. *Assigning a Symbol in the Target Display Editor (left). Results displayed in Survey (right)*



4. **Select the symbol from and click [OK].** The symbol will appear at the target location in the HYPACK® map and in the 'Extra' field in the Target file.

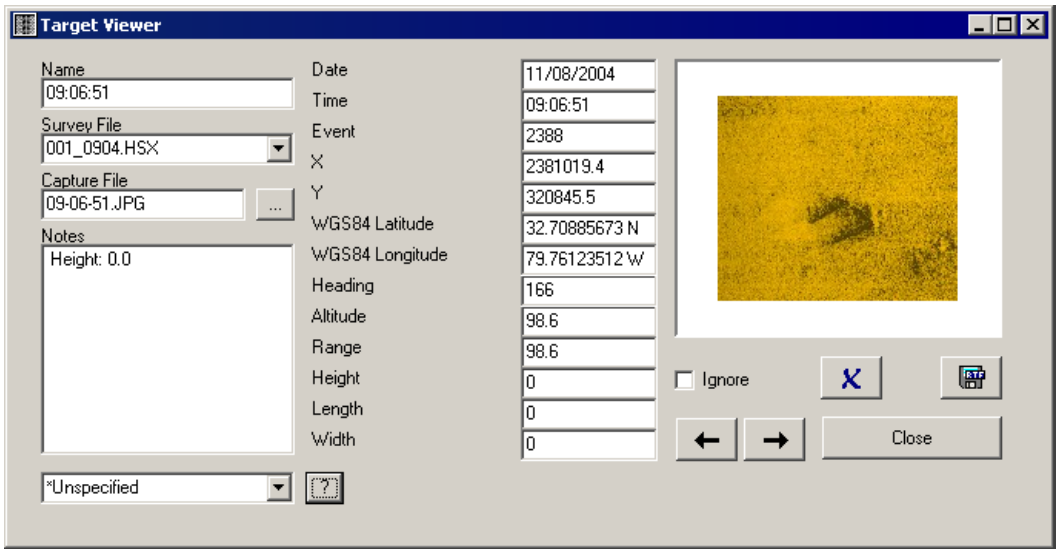
For the cleanest display, consider the target settings in the HYPACK® Control Panel. To display only the S57 symbol, set:

- Target Display = Circle
- Number of Circles = 0
- Draw Target = cleared.

REVIEWING TARGET INFORMATION IN THE TARGET VIEWER

The TARGET VIEWER displays all information about each target in one window. This is mostly *for display purposes only*; only the data in the left section can be edited in the TARGET VIEWER.

FIGURE 2-7. Sample TARGET VIEWER Display



To open the TARGET VIEWER:

- **In HYPACK®**, select SIDE SCAN-TARGET VIEWER. The program will automatically load the first enabled target file in the Project Files list. If no target file is loaded or if you want to choose a different file, select FILE-OPENand select the target file you want to review.
- **In SIDE SCAN TARGETING AND MOSAICKING**, select TOOLS-TARGET VIEWER. The targets included, in this case, depends on whether you have selected the 'One Target File per Line/Date' option in the Advanced Tab of your program options (F9).

TABLE 2-1. Targets Displayed in TARGET VIEWER

'One Target File per Line/Date' Option Selected?	Target File Loaded?	TARGET VIEWER does this...
Yes	Automatic	Loads all of the target files associated with the lines you have loaded, except the one named by the survey date.
No	Yes (Load a target file using FILE-SELECT TARGET FILE.)	Loads the currently loaded target file.
No	No	Displays a file select dialog for you to choose your target file.

Use the left and right arrows to view the targets, their corresponding statistics and screen capture (if you have saved one).

Modify any information in the left column as necessary.

- **Name**: The target name.

- **Survey File**: The survey line file that covers the area where the target is located.
- **Capture File**: Image file typically generated in SIDE SCAN TARGETING AND MOSAICKING.
- **Notes**: Short notes about the target.
- **Classification**: A classification code from the target classification database.

More Information

- "Marking Targets in Scan View" on page 5-30
- "Screen Captures in Scan View" on page 5-34
- "Target Classification" on page 2-270

TARGET CLASSIFICATION

You can classify targets according to criteria of your choosing.

Target classification is a two-step process:

1. **Build your target classification database.** This is where you define your classification codes with a title and illustrative images.
2. **Assign a classification code to each target** in the TARGET VIEWER.

More Information

- "Building the Target Classification Database" on page 2-270
- "Classifying your Targets in the TARGET VIEWER" on page 2-272
- "Reviewing Target Information in the Target Viewer" on page 2-268

BUILDING THE TARGET CLASSIFICATION DATABASE

When you decide to classify your targets, it is logical that you have a number of categories in mind to which you want to assign your targets. So the first step is to define these categories by building a reference database.

The **target classification database** is a listing of classification codes with examples of each that may be used as a reference as you classify new targets. The database information is stored in the \Hypack_2011\Support\TargetInfo folder and is used across all HYPACK® projects. You build the database in the Target Classification Database dialog.

Beware!

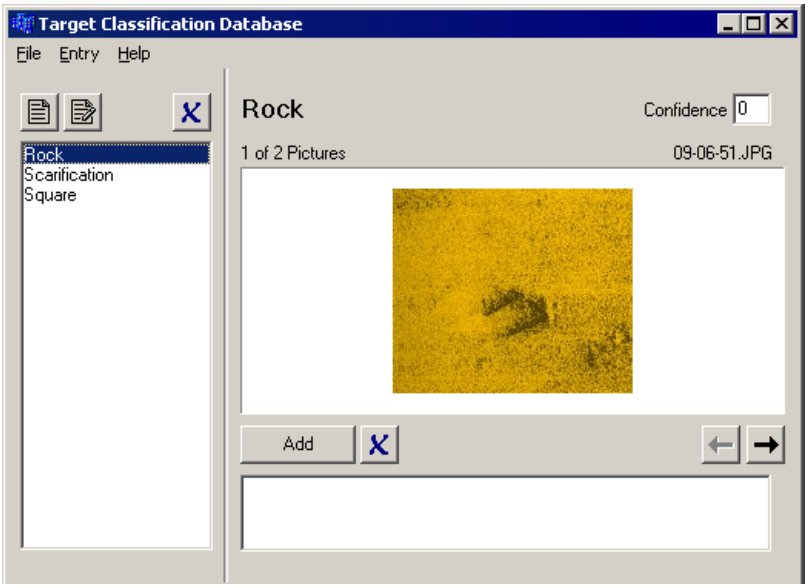
TIP: If you have multiple HYPACK® computers where the database will be used, you can copy the database between HYPACK® computers by copying the \Hypack_2011\Support folder\TargetInfo folder.

BEWARE! Do not modify the database through the Target Classification Database dialog while the SIDE SCAN TARGETING AND MOSAICKING program is open. SIDE SCAN TARGETING AND MOSAICKING will not recognize such changes and the database may be corrupted.

1. **Open the database.** The Set up the TgtClassDB.exe file, found in the \Hypack_2011folder, to run as an external program from the HYPACK® Tools menu and run it from there.

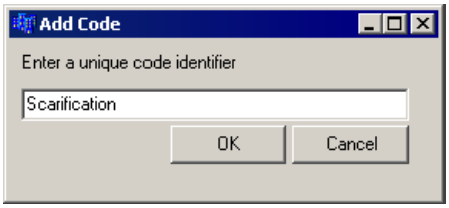
   NOTE: If you have not yet entered any data to the database, the dialog will be blank.

FIGURE 2-8. *Sample Target Classification Database Dialog*



2. **Enter your classifications**.
   a. **Select FILE-NEW CODE.** The New Code dialog will appear.

FIGURE 2-9. *Sample New Code Dialog*



   b. **Enter the code name and click [OK]**.
3. **Add existing images to each classification as available**.
   a. **Select a class** from your list on the left.

b. **Click [Add].**

c. **Browse for a BMP or JPG image that illustrates this class and click [Open]**.

d. **Set your level of confidence**. The program provides a default list of 1-5, however you may extend the list by typing other numeric values.

4. **Save the database** by selecting FILE-SAVE DATABASE.

TIP: You can also add images and their confidence levels to existing classifications in the database from the Target Classification Comparison dialog which is accessed from the Target Viewer. Select the correct classification code and click [Add Image to Code].

More Information

- "Launching External Programs from the HYPACK® Menu" on page 10-123
- "Classifying your Targets in the TARGET VIEWER" on page 2-272

CLASSIFYING YOUR TARGETS IN THE TARGET VIEWER

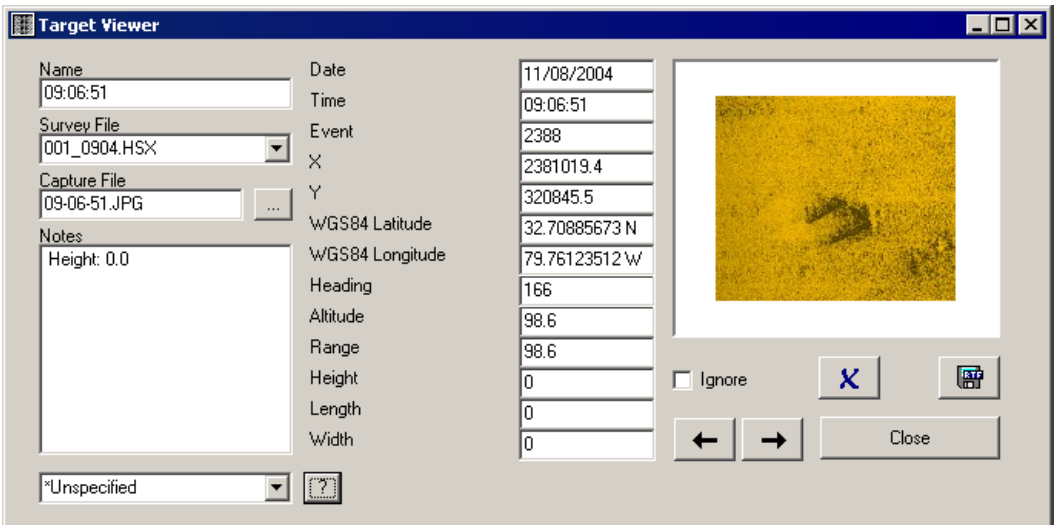
Once you have created a target classification database, you will assign a classification code through the TARGET VIEWER.

The TARGET VIEWER automatically appears when you mark a target in the SIDE SCAN TARGETING AND MOSAICKING program and you can assign a classification code at that time.

You can also open the TARGET VIEWER from the HYPACK® menu.

1. **Open the TARGET VIEWER** from HYPACK® by selecting SIDE SCAN-TARGET VIEWER. If you have one or more target files enabled in your project, the program will automatically load the first enabled target file in the Project Files list.
2. **Open a target file**. If no target file is loaded or if you want to choose a different file, select FILE-OPEN and select your target file.

FIGURE 2-10. *Sample TARGET VIEWER Display*



3. **Use the arrow buttons to view each target** in your file.

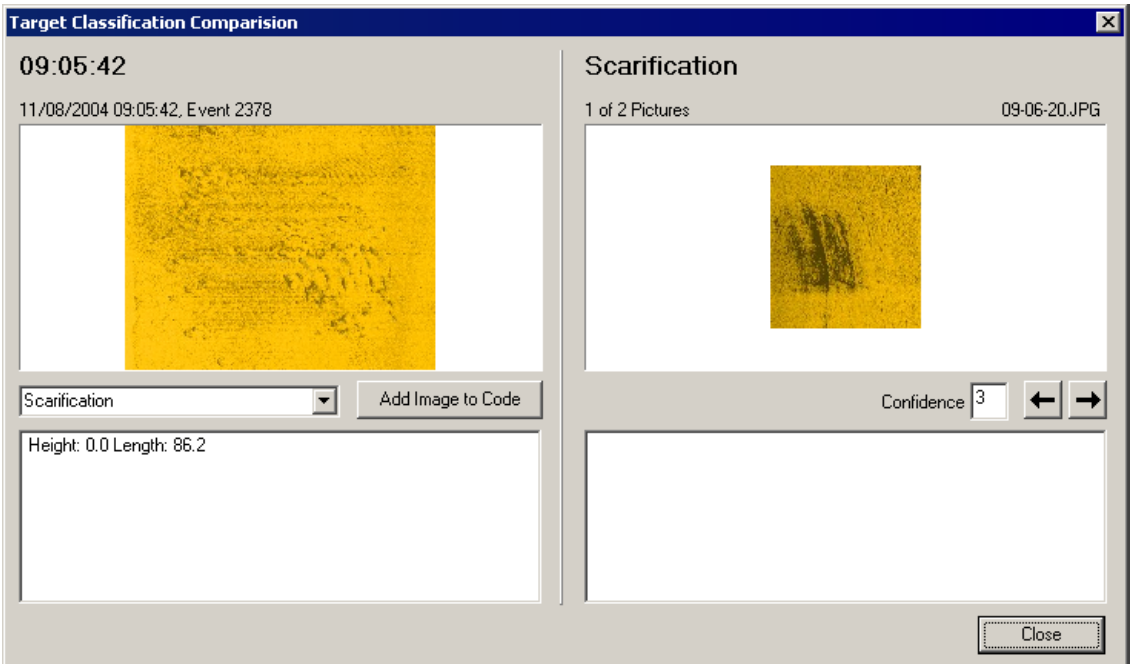
   When you view your target in the TARGET VIEWER, the classification code field is populated by the codes in the target classification database.

4. **Choose the classification code of the current target** by making a selection in the drop-down list.

5. **Verify you have the correct code (Optional)** by comparing your current target to those in the database through the Target Classification Comparison dialog.

   a. **Access the Target Classification Comparison dialog** by clicking the [?] next to the Classification Code field.

FIGURE 2-11. Sample Target Classification Comparison Dialog



b. **Compare your current target (left) with the database reference images** (right).
   i. **Select a classification code in the drop-down list.**
   ii. **Scroll through the reference images using the arrow buttons.**
   iii. **If your target does not resemble the reference images satisfactorily, repeat the process selecting a different classification code**.

c. **Add your target to the database. (Optional)** If your current target is a particularly good example of its classification, you may choose to add it to the Target Classification Database by clicking [Add Image to Code].

d. **Return to the TARGET VIEWER** by clicking [Close].

6. **Close the TARGET VIEWER** by clicking [Close].

More Information

- "Reviewing Targets in the TARGET VIEWER" on page 5-34

EXPORTING TARGET INFORMATION

You can export target information from the TARGET EDITOR or the TARGET VIEWER.

The TARGET EDITOR generates a user-configured text file which may then be imported to a text editor or spreadsheet programs.

The TARGET VIEWER generates an RTF (Rich Text Format) report which includes all target information as well as any associated image file that may have been captured in the SIDE SCAN TARGETING AND MOSAICKING program.

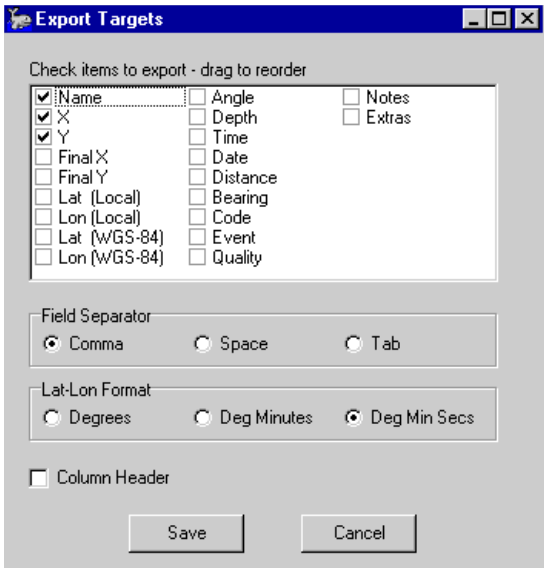
More Information

- "Exporting Target Information from the TARGET EDITOR" on page 2-275
- "Exporting Target Information from the TARGET VIEWER" on page 2-276

EXPORTING TARGET INFORMATION FROM THE TARGET EDITOR

1. **Load the Target file to the Target Editor.** You can do this by:
   - Double-clicking on the file name in the Project Files List
   - Selecting FILE-OPEN from the Target Editor menu and selecting the file you want to change.
2. **Select FILE-EXPORT TARGETS.** A dialog will appear for you to configure your output.

FIGURE 2-12. *Export Targets Dialog*



3. **Check the information** you want to export.
4. **Order the export items** by clicking and dragging them into position.
5. **Select the delimiter** to be placed between each field—a comma, space or tab.
6. **If you are exporting Lat./Lon., select the format**.
7. **To title each column in the exported file**, check Column Header.
8. **Click [Save] and name your file.** The exported file will be saved, by default to the project folder with a TXT extension.

Sample Output File:

```
455473.70,4942631.39,0.00,"Man Overboard"
455216.00,4943428.67,0.00,"Red Buoy"
454113.00,4945510.67,0.00,"Green Buoy"
```

EXPORTING TARGET INFORMATION FROM THE TARGET VIEWER

1. **Open the TARGET VIEWER**.
   - **From the HYPACK® interface,** select SIDE SCAN-TARGET VIEWER.
   - **From the SIDE SCAN TARGETING AND MOSAICKING program** in either Scan View or Mosaic mode, select TOOLS-TARGET VIEWER. The program automatically loads the targets associated with the currently loaded data.
2. **If you have opened the TARGET VIEWER from HYPACK®, load a target file**.
   a. **Select FILE-OPEN and browse for a file**.
   b. **Click [Open]**.
3. **Click the 'Save Target Book to RTF' icon**. A File Save dialog will appear.

4. **Name your file and click [Save].** The report will be saved, by default, to your project folder.

FIGURE 2-13. *Sample TARGET VIEWER Report*

Name	Date	11/08/2004
09:06:51	Time	09:06:51
Survey File	Event	2388
001_0904.HSX	X	2381019.4
Capture File	Y	320845.5
09-06-51.JPG	WGS84 Latitude	32.70885673 N
	WGS84 Longitude	79.76123512 W
	Heading	166
	Fish Altitude	98.6
	Range to Target	98.6
	Height Above Bottom	0
	Length	0
	Width	0

Notes	Height: 0.0

PLOTTING SHEETS (*.PLT)

Plotting Sheet Files (*.PLT) contain origin coordinates, scale, rotation, and sheet dimensions for plotting on smooth sheets. These files are typically created in the PLOTTING SHEET EDITOR and saved with the .PLT extension to your project file. They are used by HYPLOT to define the area to be plotted.

More Information

- "HYPLOT" on page 7-1

CREATING PLOTTING SHEETS IN THE PLOTTING SHEET EDITOR

1. **Load the files that define your survey area** (ex. background files or Planned Line Files). Right-click on background files or Planned Line Files at the lower left and select Add File and follow the prompts to select your file. You may choose to zoom-in or –out to adjust the size of the area to fit your screen.
2. **Open the PLOTTING SHEET EDITOR** by selecting PREPARATION-EDITORS-PLOTTING SHEET EDITOR.
3. **Open a new Plotting File** by selecting FILE-NEW. The PLOTTING SHEET EDITOR is open and displays, behind it, a Plotting file on a blank grid or with your background file if you have opened one. The Plotting file is defined by pink lines to indicate it is only in memory. When the file has been saved, the lines will change color according to the settings in the HYPACK® Control Panel.
4. **Set your input units**. You can enter either X,Y or Lat./Lon.. Select EDIT-UNITS to toggle from one unit to the other.
5. **If you want to position the file with your cursor, set the sizing method**. In the Edit menu, the sizing option can be toggled between Scale or Length/Width.
   - **Scale** (ft/in on foot grids or m/m on metric grids) maintains the scale ratio between the length and width of the plotting sheet.
   - **Length/Width** (inches on foot grids and cm on metric grids) enables you to resize the length and width of the plotting sheet independently of each other.
6. **Position and size the Plotting File.** You may position the Plotting file and resize it to cover your survey area.
   - **With the cursor:**
     - Click and drag the circled corner to move the plotting file.

- Click and drag the square corner opposite the circled corner to rotate the plotting file.
- Click and drag corners adjacent to the circled corner to change the length and width of your plotting area.

NOTE: If you selected the 'Scale' sizing method, the border will maintain the specified length:width ratio. Otherwise, you can scale length and width independently.

- **Edit the information in the PLOTTING SHEET EDITOR**.
  - The X-Y or Lat./Long. coordinates represent the position of the circled corner of the plotting file.
  - All other information is relative to that point.

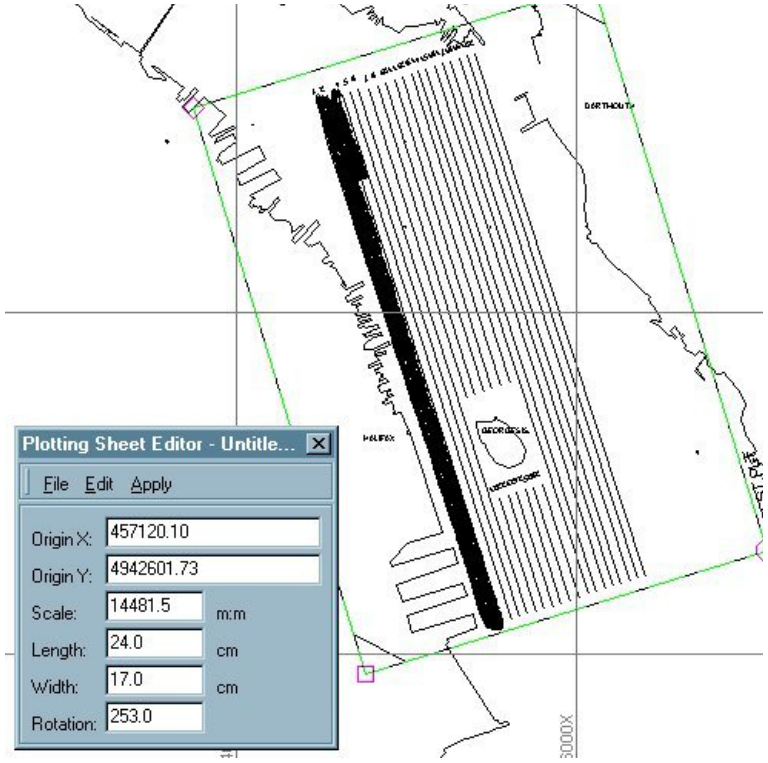
  Any changes you have made will be reflected in the screen when you click [Enter].

Note: Most standard MS Windows® printers will not print to the very edge of a piece of paper. You probably need to account for this margin. The size of the margin is printer-dependent. Check the printer's manual.
Also, you must leave space for any border you plan to add in HYPLOT.

---

7. **Save your Plotting Sheet file** by selecting FILE-SAVE and naming your file. It will be saved with the extension .PLT to your project directory and displayed in the HYPACK® Area Map .

FIGURE 2-1. *The PLOTTING SHEET EDITOR*



EDITING AN EXISTING PLOTTING SHEET FILE IN THE PLOTTING SHEET EDITOR

You can make changes to an existing Plotting file in the PLOTTING SHEET EDITOR. The changes can be savedto the original file name (overwriting it), or saved to a new file name. The procedure is very simple.

1. **Load the plotting sheet file to the PLOTTING SHEET EDITOR.** You can do this by:
   - Double-clicking on the file name in the Project Files list.
   - Selecting FILE-OPEN from the PLOTTING SHEET EDITOR menu and selecting the file you want to change.
2. **Edit the plotting sheet file**, you can click and drag the corners to move, rotate or resize the plotting area. You can also use the PLOTTING SHEET EDITOR to change the Scale, Sheet Dimensions and the positioning of the plotting area. Convert your coordinates from XY to Lat Long (or vice versa) by selecting EDIT-UNITS. You will automatically see your results displayed on the screen.

NOTE If you are editing a PLT file that has had additional display settings saved to it in HYPLOT, the display settings will remain. However,

if you are making the sheet smaller, be mindful of the placement of your non-data items (for example, the north arrow, ruler, color bar...). Objects near the top or left edge of a larger plot may disappear out of range of the smaller plotting sheet size. You will have to retrieve them by repositioning them in the HYPLOT Control Panel.

3. **When you are satisfied, save your file.** Click on either FILE-SAVE or FILE-SAVE AS . If you select SAVE, it will overwrite the original size, scale and rotation information . If you use SAVE AS, it will ask you for a new file name and create a new plotting file using that name.

The plotting sheet display in the HYPACK® window will show only the plotting sheet border.

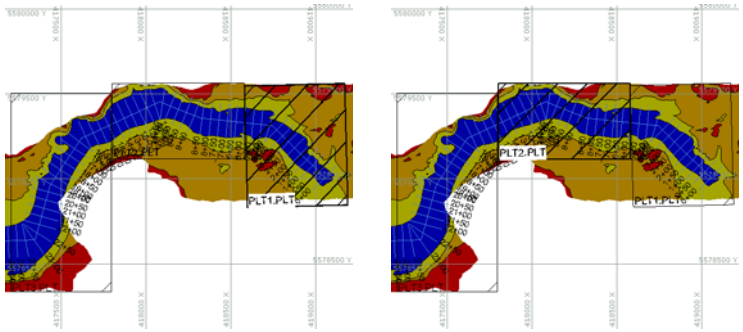
In HYPLOT, the non-data items remain positioned relative to the lower left corner of the PLT.

GENERATING PLOTTING SHEET LAYOUT GRAPHICS

When you plot your data, it is often helpful to know where your plotting sheet fits in the context of the surrounding area. This may be particularly helpful if you are plotting a small portion of a large project area.

A plotting sheet layout graphic is a bitmap screen capture of the HYPACK® area map that highlights the selected, active plotting sheet file.

FIGURE 2-2. *Sample Plotting Sheet Layout Bitmaps--PLT1.plt_SheetLayout.bmp (left), PLT2.plt_SheetLayout.bmp(right)*



To generate a Plotting Sheet Layout graphic:

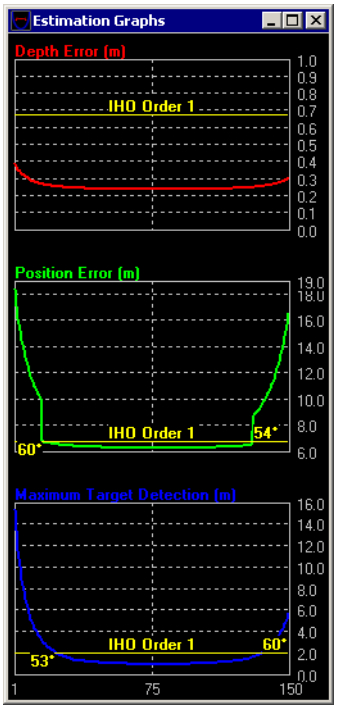
1. **Setup your HYPACK® Map display as you want it to appear in the graphic**.
   - Enable one or more PLT files.
   - Enable other project and data files you want to include.
   - Set other view options in the control panel or by selecting a scheme.

2. **In the Project Files list, right-click on the enabled PLT file that should be highlighted in the resulting graphic and select 'Sheet Layout Block'**. The graphic is automatically named *FileName*_SheetLayout.bmp and saved to the project folder.

TPU EDITOR

The TPU(Total Propagated Uncertainty) EDITOR is a 3-tabbed dialog where you must enter the general, environmental and sensor information required for TPUcalculations. Much of the sensor information can be loaded by selecting your sensors through the menus at the top of the dialog.

1. **Launch the TPU EDITOR by selecting PREPARATION-EDITORS-TPU PARAMETER EDITOR.** The editor will open with the most recent values from the TPU.ini.
2. **Configure your TPU parameters.**
   a. **If your** HYSWEEP® HARDWARE **configuration is complete, select FILE-LOAD HYSWEEP.INI.** The dialog will be populated with a offsets read from your configuration file.
   b. **Select the menu item for each device in your configuration**. The program sets values for some of the data in the General and Sensor Info tabs based on sensor information coded into the program.



3. **Review the data in each tab for accuracy.** You should make every attempt to understand the required inputs and modify the parameters to fit your survey equipment.
4. **Compare uncertainty estimation graphs to your required IHO or USACE standard**. (Optional) This predicts whether your system will meet the standard.
   a. **If the sample graphs are not visible, select FILE-SHOW GRAPHS**.

FIGURE 2-1. *Estimation Graphs (left)*

   b. **Check the standard to which you want to compare your system error.** A horizontal line will show the standard on the graph and the point at which your estmation graph intersects with the standard is labeled.
   c. **Enter various 'Estimation Graph Parameters'** in the General Tab. These values are hypothetical values which, during SURVEY, will be supplied by your survey data. You can enter different values to see how the TPU graphs are affected.

FIGURE 2-2. *TPU EDITOR - General Tab*

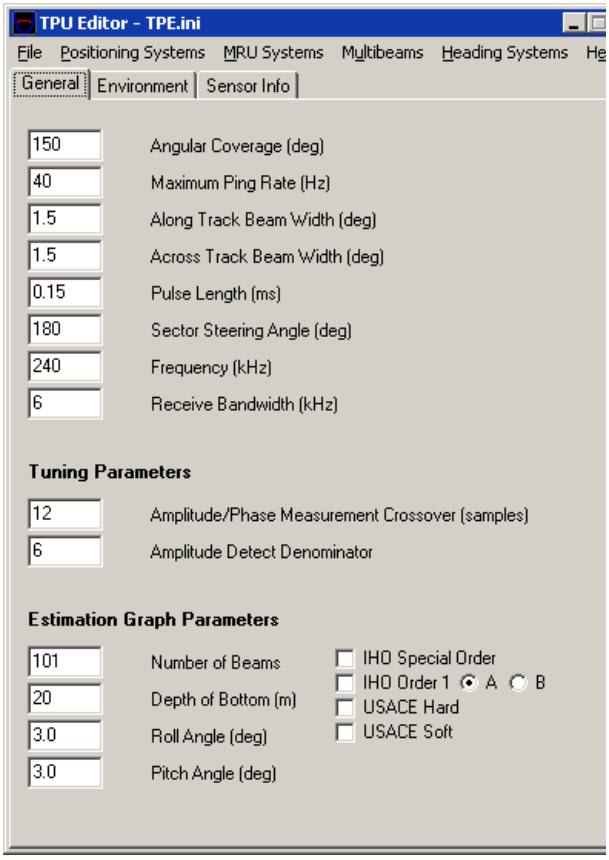


FIGURE 2-3. *TPU Editor - Enviironment Tab*

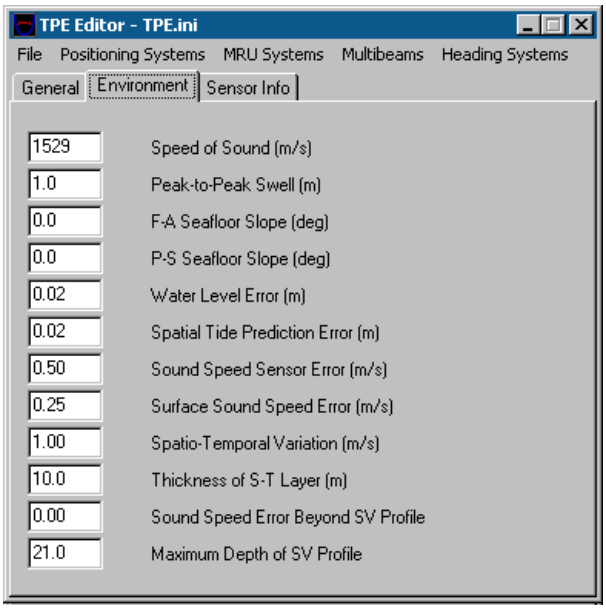
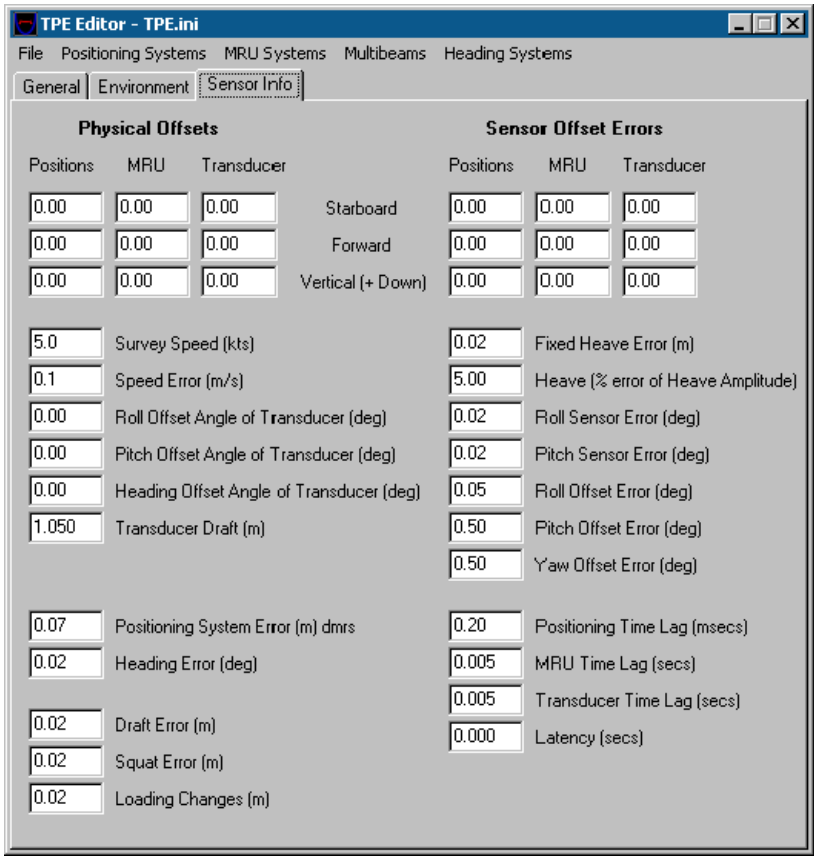


FIGURE 2-4. *TPU Editor - Sensor Information Tab*



5. **Save your TPU information.** The TPU EDITOR enables you to save multiple combinations of TPU settings for use with different hardware configurations or environmental conditions.
   - FILE-SAVE: Saves your current settings to the current initialization file.
   - FILE-SAVE AS allows you to save your settings to an alternate initialization file.
   - FILE-MAKE CURRENT saves your settings to the TPE.ini file in the \Hypack_2011 folder.
6. **Verify that the correct settings for your project are saved to the TPE.ini**.

Beware!

BEWARE! SURVEY reads *only* the TPE.ini to calculate your TPU values. If you have multiple initialization files, *be sure you save the settings to the TPE.ini.*

To save your current settings to the TPE.ini, select FILE-MAKE CURRENT.

To save your current settings to a TPU report, select FILE-SAVE RTF REPORT and name your report. The report includes replicas of each graph and a table, one for each tab in the dialog, listing your current TPU parameters.

CHAPTER 3

Survey

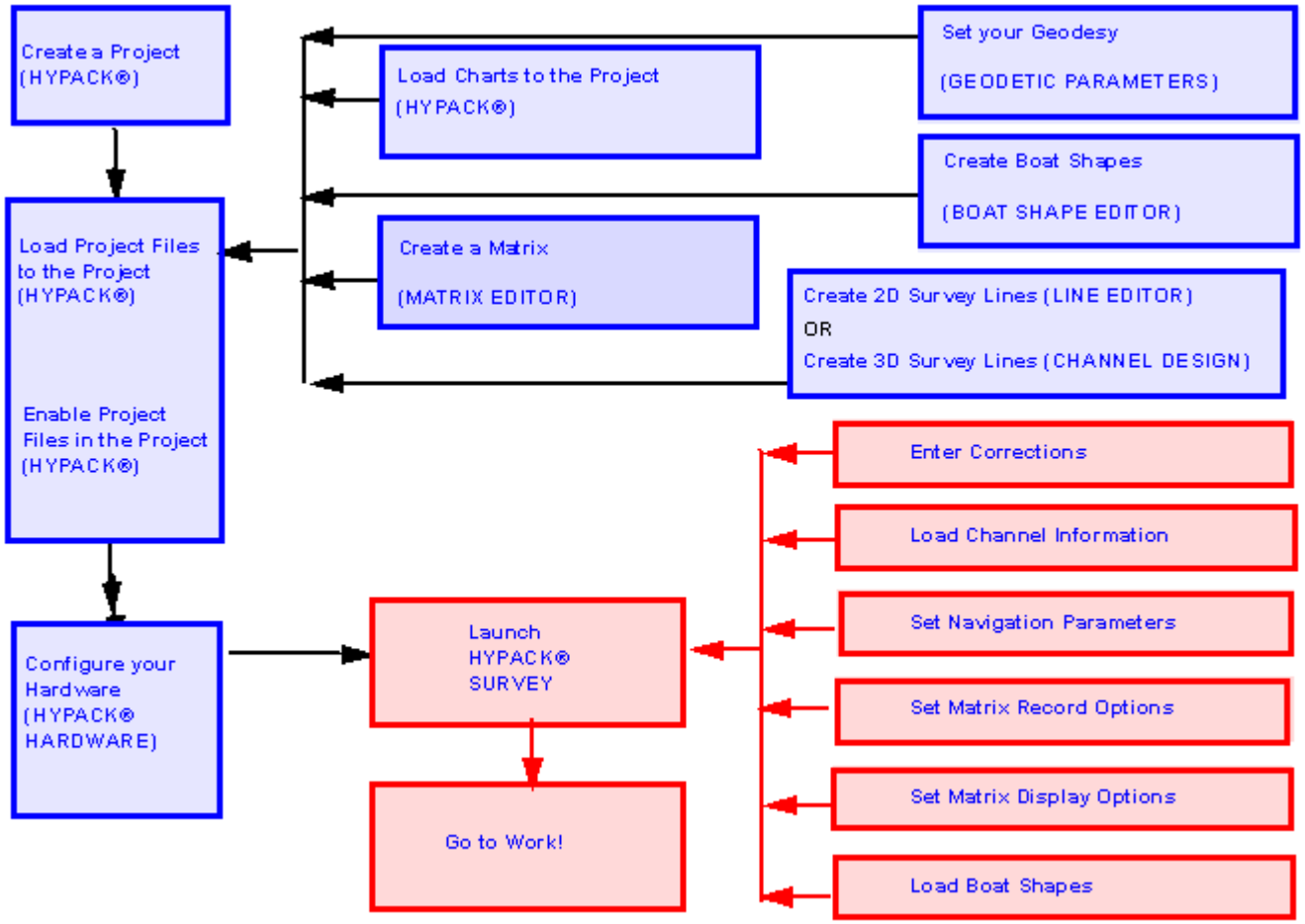
The survey programs provide you with information to monitor survey data collection and to assure full coverage of the survey area. Customize the real-time displays and set the navigation parameters to suit your normal needs and preferences then use the easy keyboard commands to manually guide your data collection.

In multibeam or side scan surveys, HYPACK® SURVEY runs simultaneously with HYSWEEP® SURVEY or SIDE SCAN SURVEY to provide the navigational data while HYSWEEP® SURVEY or SIDE SCAN SURVEY collects the multibeam or side scan data respectively.

Once you have setup your project, you are ready to set up your SURVEY options. The consider the following tasks before you begin to collect data:

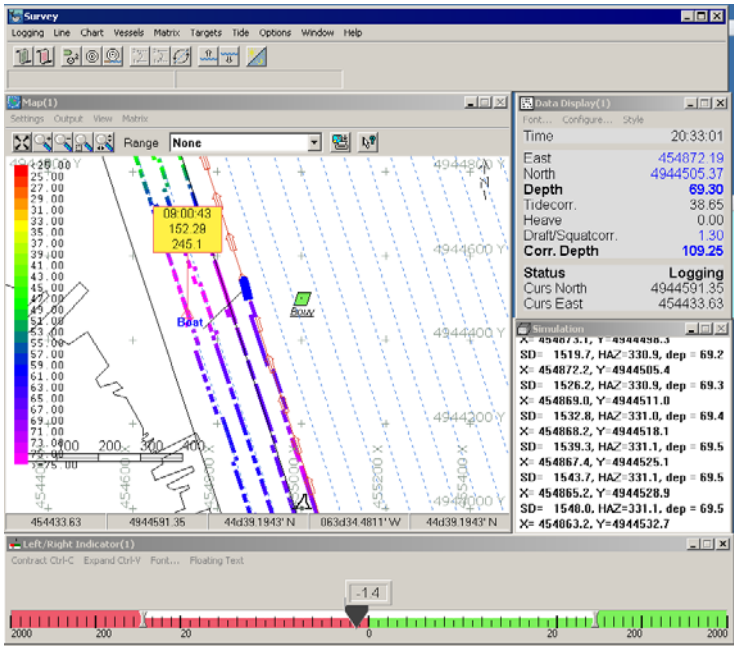
- **Set the correct geodesy settings.**
- **Test and calibrate your hardware.** Do this *before* you are far from shore with pressing deadlines.
- **Configure the size, position and features of the display windows**.
- **Load and configure planned survey lines.** (Optional. Recommended for survey projects.)
- **Set the Navigation Parameters**.
- **Input the Project Information**.
- **Configure your Boat Features**.
- **Load and configure any Target Files** (Optional.)
- **Load and configure any Matrix Files** (Optional. Recommended in dredging projects.)
- **Preset your Tide Corrections information** (Optional.)
- **Automate your Draft/Squat** (Optional.)

FIGURE 3-1. *SURVEYFlow Chart*



HYPACK® SURVEY

FIGURE 3-2. *Program Interface*



To launch SURVEY, click the SURVEY icon (the whale) or select SURVEY-SURVEY.

The SURVEY program loads the information from the current project. It gets geodetic information and hardware information by reading the project's initialization files. It will load the most recently used planned survey line file (*.LNW) from the current project, as well as any background files and matrix files that are currently 'Enabled'.

SURVEY functions can be executed through the menus in the shell, the (optional) tool bar, or through keyboard shortcuts.

FIGURE 3-3. *SURVEY Tool Bar*

The tool bar is a row of icons that duplicate the function of several of the menu selections. To determine each icon's function, hold the cursor over the icon and a tool tip will appear.

Though color schemes are defined in the SCHEME BUILDER program, you can choose an alternate color scheme to use while you are in SURVEY from the OPTIONS-COLOR SCHEME menu item and SURVEY will immediately assume the new color scheme. This is handy if the environmental lighting changes while you are working as it allows you to change to a more suitable scheme without suspending your survey.

More Information

- "Managing Files in your Project" on page 1-58
- "Display Schemes" on page 1-45
- "Calibrating your Hardware" on page 2-168
- "Project Information in SURVEY" on page 3-73

WINDOWS IN SURVEY

- **Profile:** Displays the cross section profile and off-line information for the entire planned line.
- **Device Windows:** Each device (GPS, echosounder, etc.) has an independent window that displays information relative to that device.
- **GPS Graphs**: Graphical displays of various GPS-related data.
- **Alarms**: Alarms are displayed along the bottom of the SURVEY shell. These are used to denote error conditions to the operator.

To generate additional window displays, select WINDOW-NEW and select the type of window you want.

SURVEY can display multiple windows of each type, each independently configurable through its menus. Multiple windows of the same type are distinguished by numbers, both on their title bars and in the Window Manager.

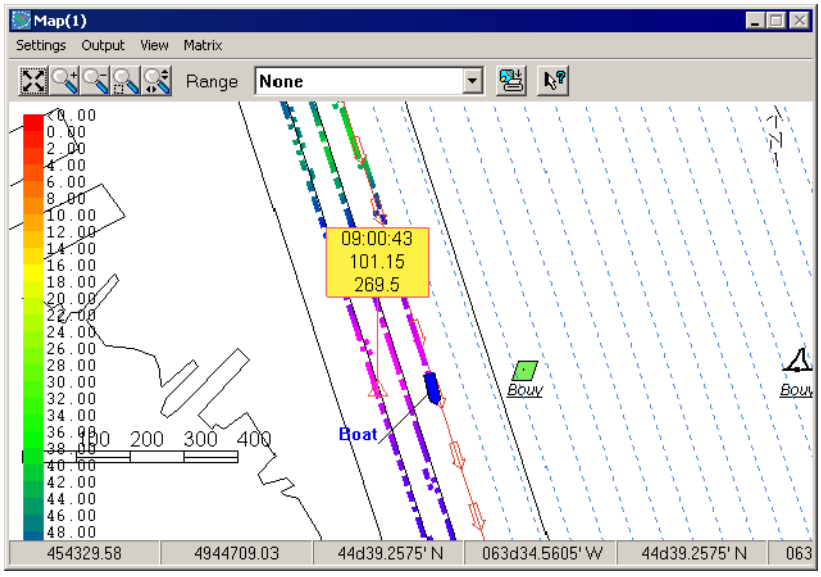
You may reposition and size all windows using the Window Manager or by using the cursor to drag the title bars and window edges. Arrange the windows in one or more monitors.

Once you have sized and placed the windows on the screen, the SURVEY program will remember and restore them to the same status and location each time you start the SURVEY program.

AREA MAP IN SURVEY

The Area Map window contains a plan view of your survey area that includes all files active in HYPACK® when you start SURVEY and a symbol representing each mobile in your hardware configuration.

FIGURE 3-4. *A sample Area Map*



Sounding colors are determined by the project's color settings. The position of the survey boat is updated on the Area Map at an interval defined by the GPS Update Frequency in the HYPACK® HARDWARE program.

When you exit the SURVEY program, it records the status of the items in the Area Map and restores the same configuration when you re-start the program.

More Information

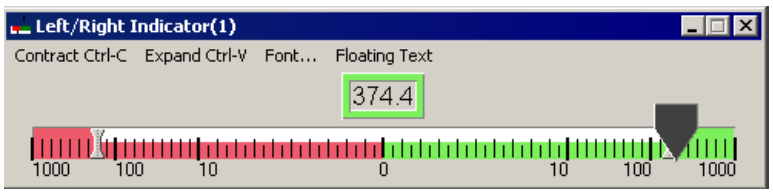
- "Sounding Color Settings in HYPACK®" on page 1-34
- "Multiple Mobiles" on page 2-231
- "Configuring your Area Map Display" on page 3-29

LEFT-RIGHT INDICATOR IN SURVEY

The Left-Right Indicator window only appears when you have planned lines loaded into the SURVEY program. It shows the position of the survey boat relative to the planned survey line.

Additional, displays can be loaded by selecting WINDOW-NEW- LR INDICATOR.

FIGURE 3-5. *The Left-Right Indicator*



Configuring the Scale

To configure the scale of the display:

To contract the scale:

- Click 'Contract' on the menu bar.
- Use Ctrl-C (Contract) from the keyboard.

To expand the scale:

- Click 'Expand' on the menu bar.
- Use Ctrl-V (Expand) from the keyboard.

NOTE These keyboard commands only work with the focus on the Left-Right Indicator window.

Configuring the XTE Label

To Configure the Cross Track Label:

The cross track error label is a real-time display of the distance off line. The font and float properties can be configured to meet the needs of different operators.

To modify the font, click 'Font' in the indicator menu. The Windows® Font Dialog will appear for you to make your adjustments. *Only the font, style and size apply.* These settings override the current scheme until you exit SURVEY.

The label can float above the pointer in the indicator or remain centered over the graphical display.

To toggle the float setting, just click the 'Floating Text' menu option. SURVEY alerts you that your vessel is too far off the currently selected survey line. You can decide the distance at which you will be alerted.

Setting the XTE Alarm Distance

To set a "Cross Track Error Alarm" distance:

- **Drag the tab indexes in the left–right indicator window.** The tab indexes are small gray bars, equidistant from center on the indicator scale.
- **Set the XTE limit in the Navigation Parameters dialog** (in the Options menu).

When this setting is changed, all other Cross Track Error displays update accordingly.

When the boat travels outside this range, the frame around the cross track label will turn either red (planned line is to starboard) or green (planned line is to port), and the 'XTE' alarm will appear in the shell. This has no effect on the data logging and is only a visual alarm to the helm to steer toward the survey line.

DATA DISPLAY WINDOW IN SURVEY

The Data Display window shows textual information about the survey.

FIGURE 3-6. The Data Display Window

When you first start the SURVEY program, the display will not contain any items. You choose the data to be displayed, and the order and the font used to display each item.

Once the Data Display has been configured, the SURVEY program will restore the items and font in the same way, when the program is re-started.

The menu in the Data Display window is used to configure the Data Display. You can select the items to display, the font of the displayed items, or change the style of the display.

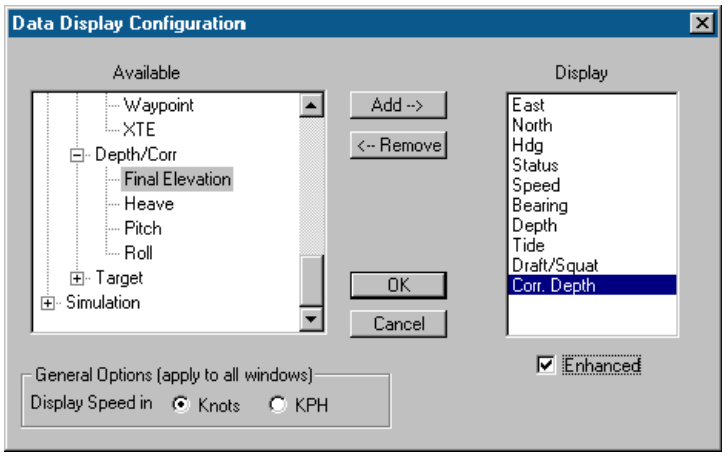
Selecting the Data Display Items

To Choose the Data Display Items:

You can select the items displayed and the order that they are displayed using the Data Display Configuration dialog.

1. **Select CONFIGURE on the menu bar** and the Data Display Configuration window will appear.

FIGURE 3-7. Configuring the Display



2. **Select the items to be displayed**.

   There are two lists; ‘Available’ and ‘Displayed’. The items in the ‘Displayed’ list will appear in the Data Display.

To move any item from one list to the other, do either of the following:

- Double-click on the item
- Select the item in the list, then click [Add=>] or [<=Remove].

Items will appear in the Data Display in the order they have been added to the Display list. To re-configure the entire order, just drag the items up or down the Display list.

If your configuration includes multiple vessels, each vessel will have a list of items which will be preceded by the vessel name in your Data Display window. For example, if you have main vessel and a towfish named “ROV”, you will find items named “ROV–East”, “ROV–North”, etc.

The Data Display uses black for all items that are not associated with a specific vessel. It uses the outline color designated for each vessel to display vessel-specific information. This is an easy way to distinguish between the different vessels in the Data Display.

NOTE If you are surveying with only a multibeam system, the depth reading in the Data Display will be the nadir depth. (The hysweep.dll must be installed to report this data.)

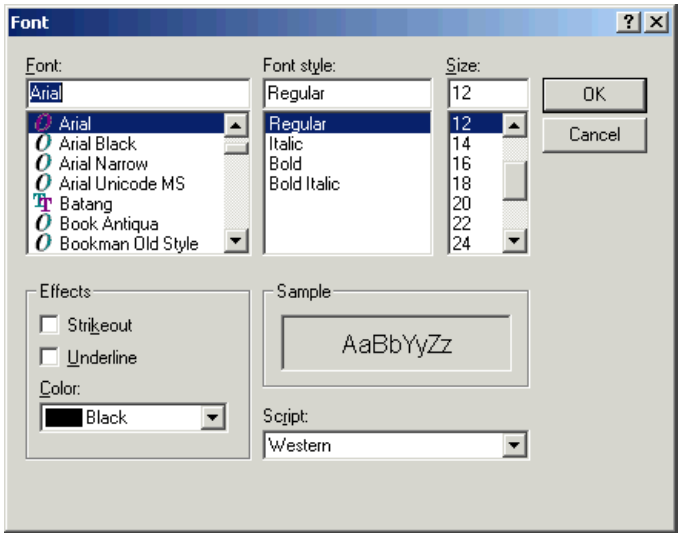
TIP: If you load Cursor East and Cursor North, you can drag your cursor between two points to temporarily display the corresponding distance and bearing measurements in your Data Display Window.

View Options:

- **Display Speed:** Choose to display your speed in knots or kilometers/hour.
- **Font:** The Font in the Data Display can be temporarily changed to meet the needs of different operators through the menu. These settings override the current scheme until you exit SURVEY.

  To Set the Font, select DISPLAY-FONT and set your font in the Windows® Font dialog. *Only the font, style and size apply.*

FIGURE 3-8. Selecting the font for the Data Display



- **Enhanced Display:** Select items in the Data Display can be enhanced (written in a bolder font) to make them stand out among the other items.

  To "Enhance" an item, click on the item in the 'Display' list you want to enhance and then check the 'Enhanced' box.

  NOTE The "Enhance" feature will work best, if you are using a standard font. If you have selected a "Bold" type font, it will be less effective.

PROFILE WINDOW IN SURVEY

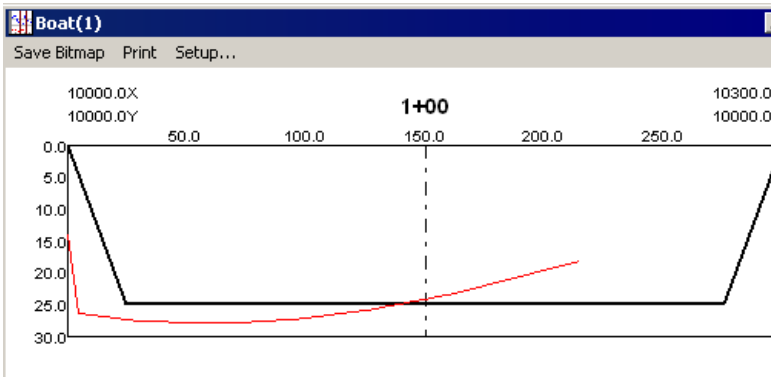
The Profile window is only available if you have planned survey lines loaded in the SURVEY program.

To generate a Profile window, click [Display Profile] in the vessel setup dialog for the vessel whose profile you want to see.

The Profile Window shows a cross section view of the entire planned survey line. The channel profile will automatically display if the planned line file contains channel template information. Otherwise, you will need to load that information separately.

The Profile Window display updates during logging and, when you end line, it remains on the screen until the next survey line is begun (status changes to on-line). Then, the Profile Window clears and the information for the new line is drawn.

FIGURE 3-9. *The Profile Window*



LOADING CHANNEL PROFILE INFORMATION

If your planned line file does not include channel template information, you can load any of the following files in SURVEY to provide that information.

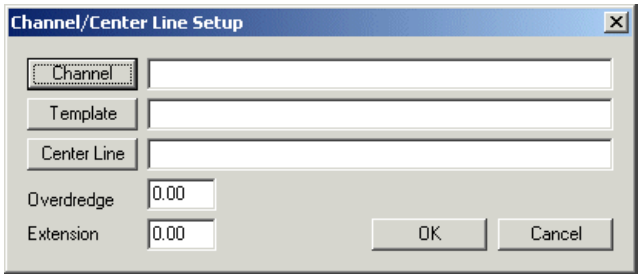
The cross section profile in the Profile window can be drawn from:

- **A Channel Plan file** (*.PLN) created in CHANNEL DESIGN.
- **A 3-dimensional Line file** (*.LNW) created in CHANNEL DESIGN or in the LINE EDITOR.
- **An Advanced Channel file** (*.CHN) from ADVANCED CHANNEL DESIGN or TIN MODEL.
- **A combination of a 2-dimensional center line created in the LINE EDITOR and a template (*.TPL) created in CROSS SECTIONS AND VOLUMES or LINE EDITOR.** In this case, the line file should have only one line representing the center line of the channel. It can be a multi-segmented line. Create the template file referencing the distances to the center line; negative values are left of the center line and positive values are right. Negative depths will be recognized as points above chart datum. The program will automatically enter the correct depths and widths according to the template information. The resulting channel will also be displayed in the Map Window.

Loading Channel Features:

1. **Select CHART-CHANNEL** and the Channel/Center Line Setup dialog will appear.

FIGURE 3-10. *The Channel/Center Line Dialog*

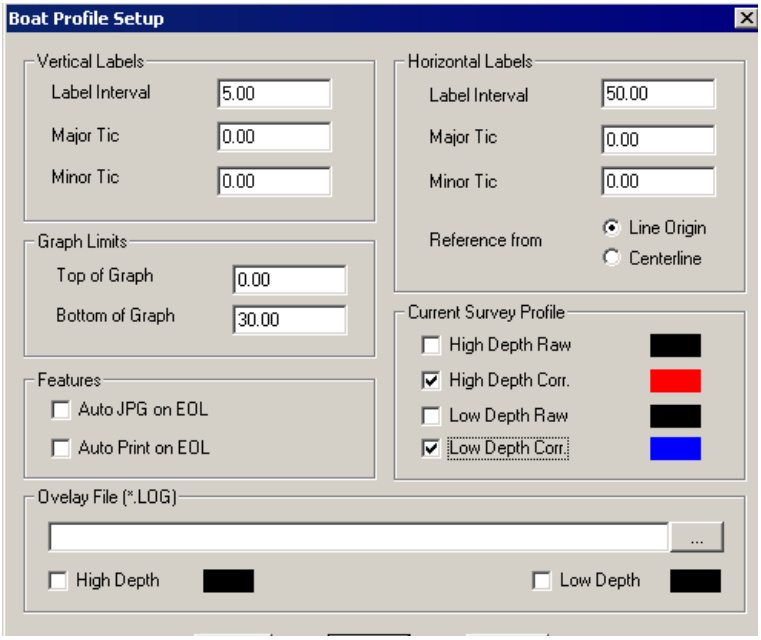


2. **Click the button that corresponds to the information type** you want to add and choose the file through the File Select dialog. [Channel] accepts PLN, CHN or LNW files.
3. **Add any Overdredge or Extensions**.
   - **Overdredge** draws a line a user-defined distance outside of the template, parallel to the side slopes and bottom.
   - **Extensions** lengthen the features outward from the top of the bank by this amount.
4. **Click [OK]**.

CHANNEL PROFILE SETTINGS IN SURVEY

To configure the profile window, click 'Setup' in the profile window menu. The Profile Setup Window will appear.

FIGURE 3-11. *Profile Setup Window*



Vertical and Horizontal Label settings control the spacing of the labels and tics on each axis of the graph.

The **Top of Graph** and **Bottom of Graph** are used to set the depth values at the top and bottom of the depth portion of the Profile Window.

To set colors for each trace, click its corresponding color block in the dialog. The standard Colors dialog will appear. Just select the color that you want then click [OK].

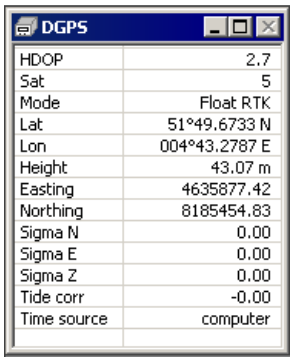
The **Auto JPG** and **Auto Print** options save an image of the completed profile window when you end each line. Auto JPG saves a digital image, while Auto Print sends the image to your default printer. The display clears and begins again when you go start logging the next line.

Since survey boats are not usually equipped with printers, set your default printer to a PDF writer, then print them to paper later.

DEVICE WINDOWS

Each device you have selected in the HYPACK® HARDWARE program will generate it's own window. The device driver, not the SURVEY program, controls the content of each window. This means that the information for different devices will vary according to the device type and model.

FIGURE 3-12. *GPS.dll Device Window*

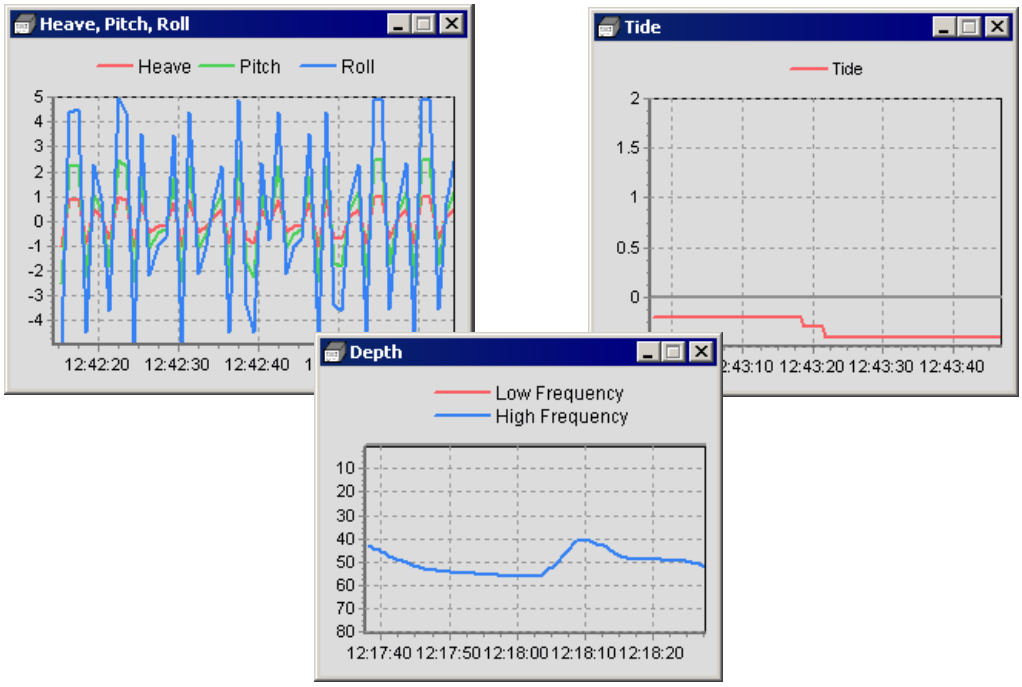


You can also adjust the scale of the display by resizing the window itself and often by using the mouse wheel to zoom in and out.

There are additional 'device windows' that display depth, tide or heave, pitch and roll (HPR) data from shared memory. Each window is a scrolling, event-annotated graph display. These windows are similar to the device windows generated by each device driver except you can choose the mobile from which you want to display data.

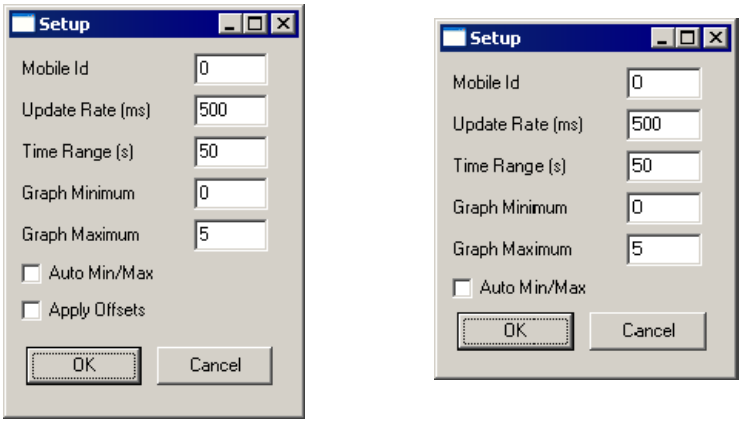
To access these device windows, select WINDOW-NEW-DEVICE and the required window name.

FIGURE 3-13. *Sample Device Windows--HPR (top left), Tide (top right), Depth (bottom)*



To access the view options window for each window, right-click on the graph you wish to modify and select ‘Setup’.

FIGURE 3-14. *Configuration Dialog - Depth and HPR Device Windows (left), Tide Window (right)*



- **GPS Device ID:** Devices are numbered according to the order in which they are entered. The first device ID is ’0’.
- **Update Rate of the graph** determines how frequently new data is recorded to the graph.
- The **Time Range** defines the horizontal range of the graph.

- **Graph Minimum** and **Maximum** values to define the vertical range of the graph where applicable. Check **Auto Min./Max** to let SURVEY adjust the range to fit the data.

GPS GRAPHS

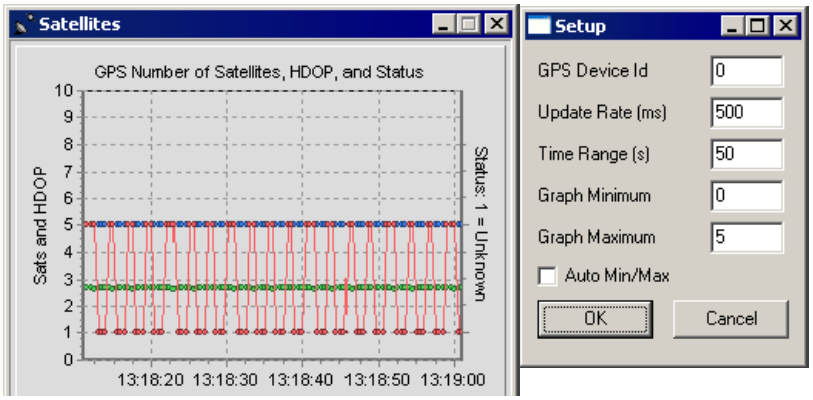
GPS drivers provide several real-time graphical displays of data extracted from your GPS input. Each value is configured and graphed independently. You can choose to display any number of displays offered.

Most of the graphs are linear displays:

- **Number of Satellites**
- **Undulation**
- **Ellipsoidal Height**
- **Sync Error**
- **Math**
- **Sky**

To access the view options window for each window, right-click on the graph you wish to modify and select 'Setup'.

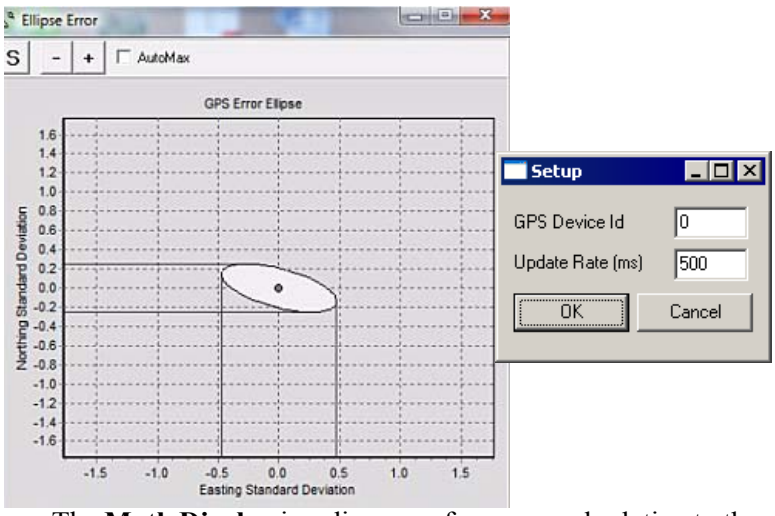
FIGURE 3-15. *Sample Graph Setup Options - Ellipsoidal Height*



- **GPS Device ID:** Devices are numbered according to the order in which they are entered. The first device ID is '0'.
- **Update Rate of the graph** determines how frequently new data is recorded to the graph.
- The **Time Range** defines the horizontal range of the graph.
- **Graph Minimum** and **Maximum** values to define the vertical range of the graph where applicable. Check **Auto Min./Max** to let SURVEY adjust the range to fit the data.

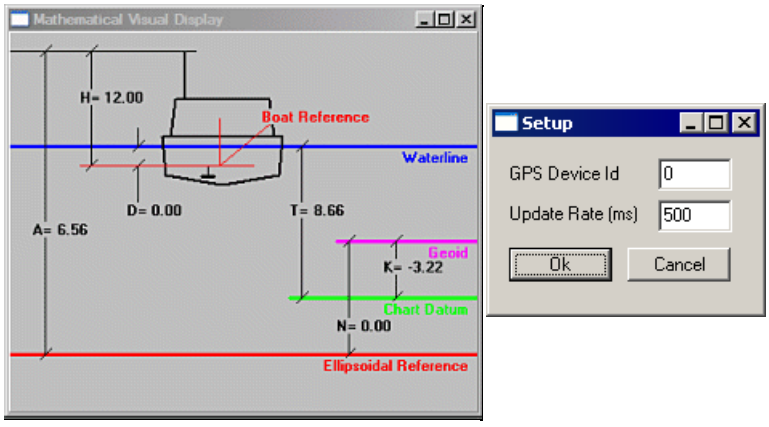
- The **Ellipse Error** graph shows the error in the ellipsoid, which is calculated from data in the PTNL,QA or GST string. Select the appropriate scale factor to size the ellipse to fit the screen.

FIGURE 3-16. *Sample Ellipse Error Graph (left) and Setup (right)*



- The **Math Display** is a diagram of your vessel relative to the surfaces in your survey. It displays each value (measured and calculated) in the real-time kinematic tide calculation.

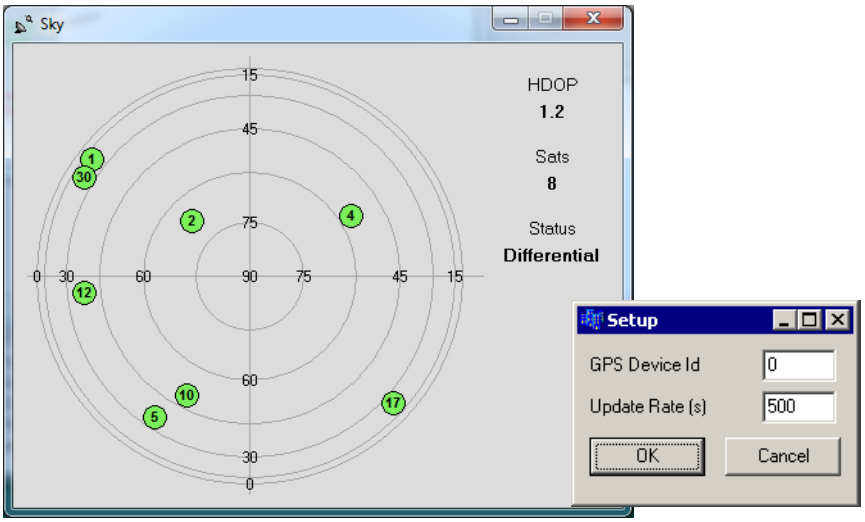
FIGURE 3-17. *Math Display in SURVEY (left) and its setup (right)*



- The **Sky window** displays the position of available satellites (90 degrees is straight overhead) with their Sat ID written inside their symbol. If their signal to noise ratio is adequate (it usually is), the satellites are colored green. If the signal-to-noise ratio of a satellite is less than required, it turns them red.

NOTE: This display requires the GSV string from the GPS.

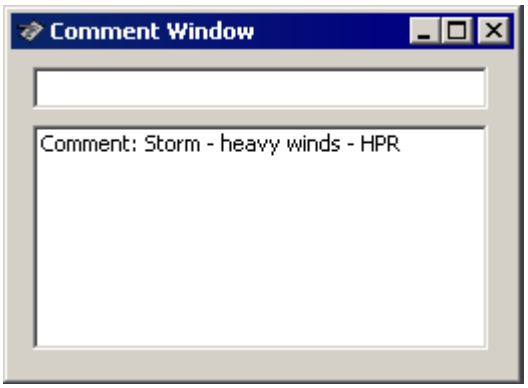
FIGURE 3-18. *Sample GPS Sky window*



COMMENTS IN SURVEY

The **Comment window** stores your input to the project log.

FIGURE 3-19. *Sample Comments Window*



Enter your notes in the field at the top. Each time you press your Enter key, your comment drops down to the display in the lower part of the window and a copy is stored to the project log. In the SINGLE BEAM EDITOR and HYSWEEP® EDITOR, you can refer to these comments during the editing process.

ALARMS IN SURVEY

Alarm windows are located along the bottom of the SURVEY screen. When the criteria are met, the alarm window turns red and the Windows® exclamation alarm sounds. You can turn off the audio alarm by pressing the Escape key. This will also change the alarm boxes to yellow until the reason for the alarm has been corrected.

The SURVEY program can generate the following alarms:

TABLE 3-1. *Survey Alarms*

Alarm	Text Displayed	Reason	Documented
Track Error Alarm:	XTE	Generated when the tracking point is outside the limit set in the Navigation Parameters dialog or the Left-Right Indicator.	Trace File[a]*
Time Out Alarm:	Time Out	Generated when a device has not reported an update within the last 5 seconds.	Survey Log
Driver Alarm:	Driver Name	When an RTK GPS drops from Kinematic to Differential and this option is checked in the GPS Device Setup dialog.	Survey Log
Min Depth:	Min Depth	Generated when the measured depth drops below a value defined in the Navigation Parameters dialog.	Survey Log
Heave Drift	Drift= Current Drift Value	If the heave value differs from the average of the last 100 heave readings by more than the "Alarm Threshold" set in the Vessel Setup.	Survey Log

a. * The Trace file is named RAW date.txt (for example RAW0927.txt) and saved in your project directory. It contains basic information about which files you are using as you survey, as well as data about events, targets, logging, etc. You can read it with any text editor.

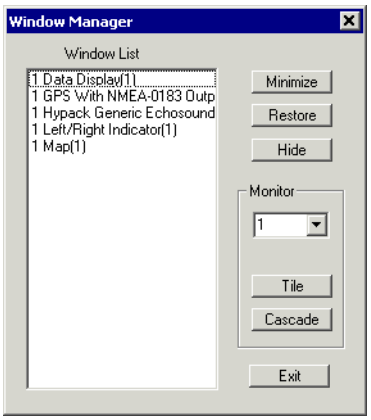
CONFIGURING YOUR WINDOW DISPLAY WITH THE WINDOW MANAGER

The Window Manager may be used to arrange your survey windows in one or more monitors.

1. **Access the Window Manager** by selecting WINDOW-WINDOW MANAGER in the SURVEY shell. The Window Manager will appear with a list of your current Survey windows.

   Multiple windows of the same type are distinguished by numbers, both on their title bars and in the Window Manager.

FIGURE 3-20. *Window Manager*



2. **Choose the windows** to view.
   a. **Select one or more windows** in the list.
   b. **Click [Minimize], [Hide] or [Restore]**.
      - **[Minimize]** closes the selected window and positions a restore button at the bottom of the screen.
      - **[Hide]** closes the selected window. It can only be restored through the Window Manager.
      - **[Restore]** reopens the selected window in your display.
3. **If you have multiple monitors**, assign windows to each monitor. (Optional) The monitor numbers designated in the Windows® display settings populate the Monitor drop-down list.
   a. **Select the monitor window** to configure.
   b. **Select the windows for the selected monitor**.
4. **Position the windows in the monitor.**
   a. **Select the windows for the selected monitor**.
   b. **Click [Tile] or [Cascade]**.
      - **[Tile]:** SURVEY attempts to arrange the selected windows optimally on the screen.
      - **[Cascade]** arranges all of the windows, diagonally offset from each other, in the upper-left corner of your screen.
5. **Click [Exit] and manually make any final adjustments** to window size and positioning.

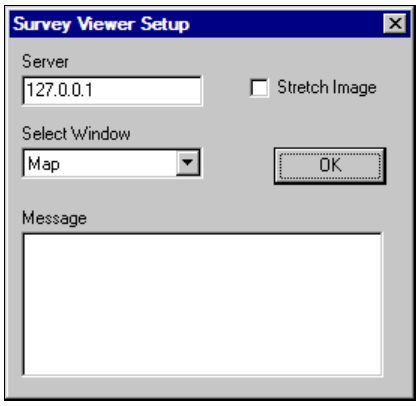
BROADCASTING SURVEY WINDOWS OVER THE NETWORK TO THE SURVEY VIEWER

The SURVEY program can broadcast its windows over the local network to be received by any computer using the SURVEY VIEWER program. You can also send and receive broadcasts on the same computer in order to create a helmsman display on one monitor and the survey window on another, or monitor a survey or dredge offsite via a wireless network.

SURVEY VIEWER is the program that will receive the window broadcast over a network and must reside on the receiving computer. It is a free-standing executable that requires no license or hardlock. The SURVEY VIEWER program and its supporting files are found in the \hypack\survey viewer folder. Copy these files to a single file, in any location, on the receiving computer.

1. **On the Survey computer do the following:**
   a. **Set network file sharing and security settings to allow file sharing.**
   b. **Launch** SURVEY and configure your Survey windows.
2. **On the receiving computer, do the following:**
   a. **Launch the SURVEY VIEWER** by selecting surveyviewer.exe through the Windows® Start menu (or set it up to launch from the HYPACK® TOOLS menu). The SURVEY VIEWER dialog will appear.
   b. **Enter your options** at the top of the dialog.

FIGURE 3-21. *Survey Viewer*



- **Server:** The IP address and **Port** Number of the broadcasting computer on your network. If you are running the viewer on the same PC, use the values as shown below.
- **Select the window.** You can select from the list in the drop-down box. Select Survey Window to display all of the windows in the Survey screen. Alternately, you can choose to view an individual window. You can also run more than one instance of SURVEY VIEWER—one for each window from SURVEY you want to see.
- **Stretch Image:** If this is cleared, SURVEY VIEWER retains the same size windows as on the survey computer. If this option is checked, your display will be sized to fill the SURVEY VIEWER window and may not be orthographically correct.

FIGURE 3-22. *SURVEY Map Window Displayed in Survey Viewer—Stretched*

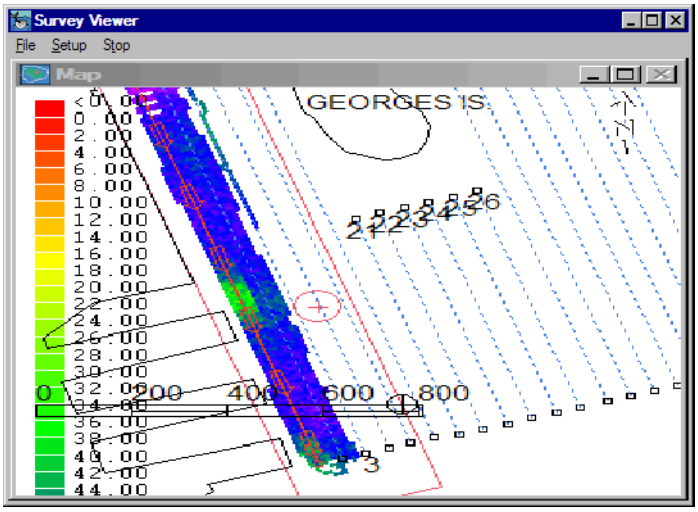
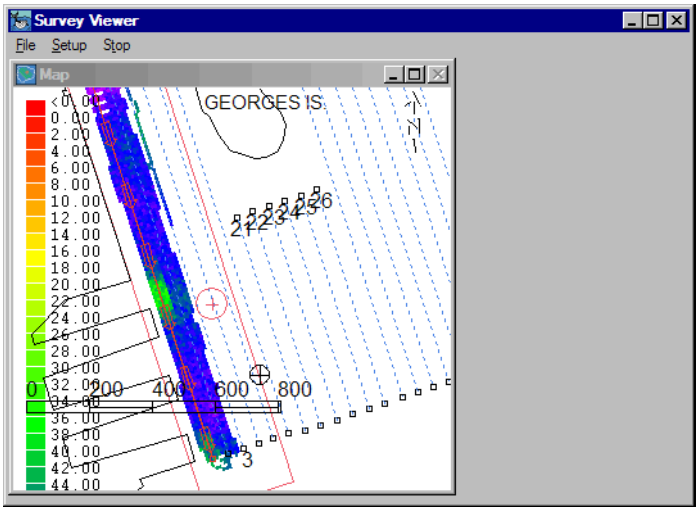


FIGURE 3-23. *SURVEY Map Window Displayed in Survey Viewer—Not Stretched*



c. **Click [Start]** to begin viewing the selected win

More Information

- "Monitoring SURVEY over the Network with the WebIF Driver" on page 2-250

SHARED MEMORY PROGRAMS

The Shared Memory programs enable you to display and export information from the SURVEY program. These programs were developed to enable you to write powerful interface drivers for application programs without having to interfere with the SURVEY

program. These programs can be launched from the OPTIONS–SHARED MEMORY menu item of SURVEY.

MEMORY VIEWER

This program is used to monitor items from the SURVEY program. It also provides for scrolling DOP and # of Satellites graphs which can be useful while surveying.

Start the program by selecting OPTIONS–SHARED MEMORY–MEMORY VIEWER. The program will automatically seek and display the information to the screen.

FIGURE 3-24. *Vessel Information window from Memory Viewer*

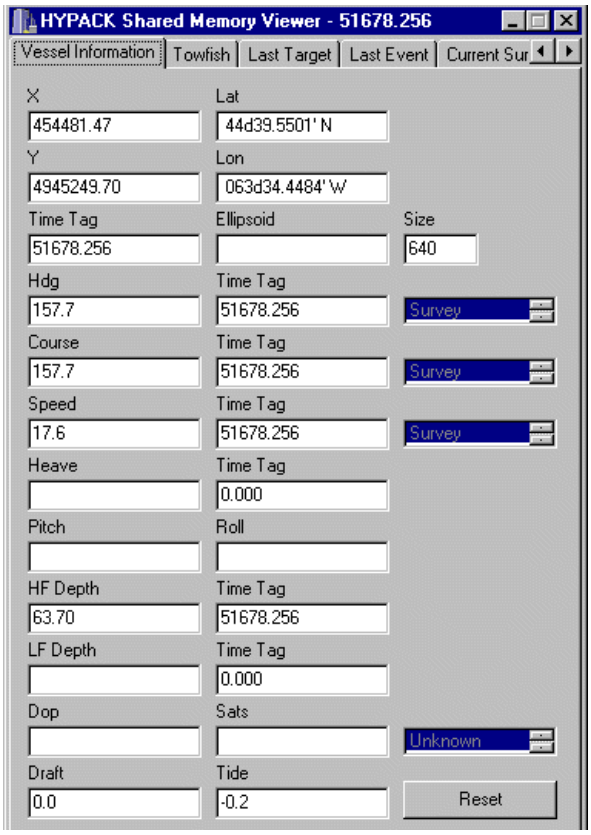


FIGURE 3-25. *DOP History window from the Memory Viewer program*

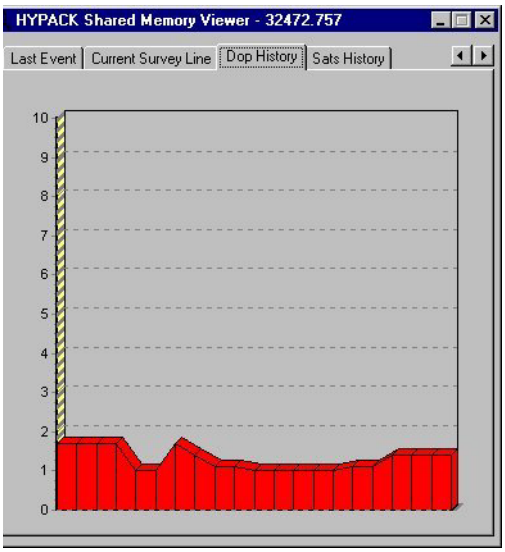
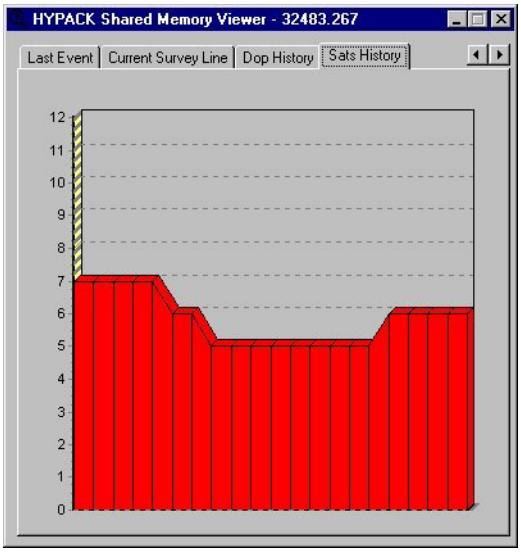


FIGURE 3-26. *# of Satellites window from the Memory Viewer Program*



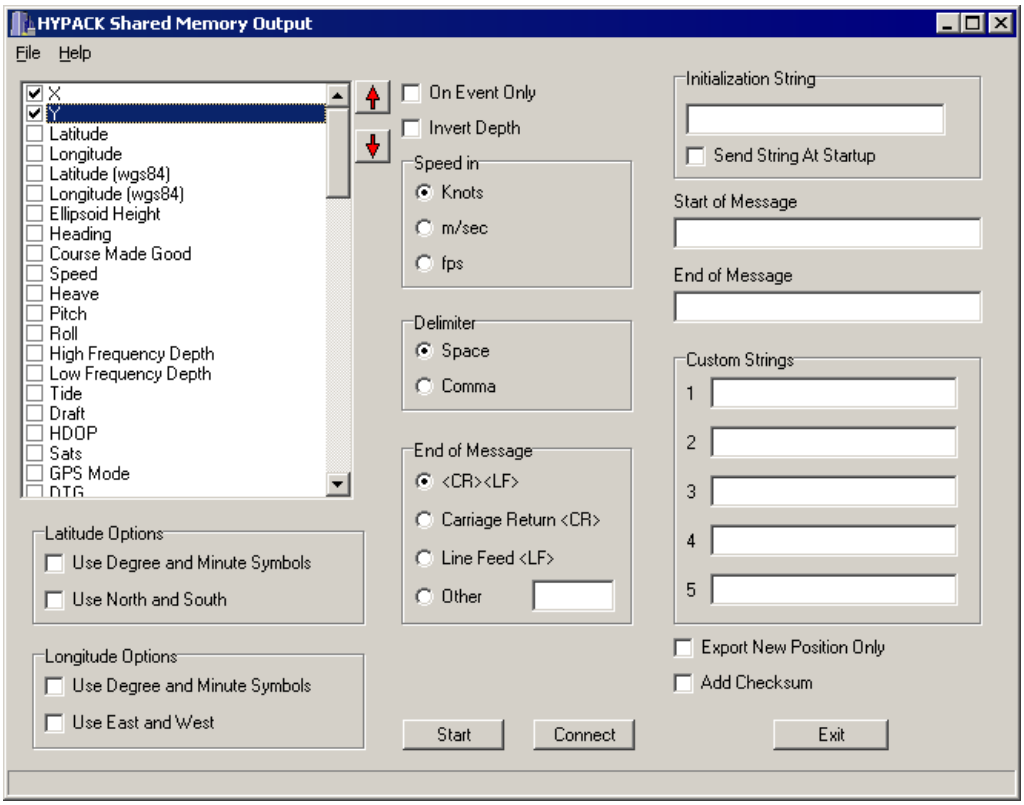
SHARED MEMORY OUTPUT PROGRAM

The Shared Memory Output program is used by those who need to save specific data from the HYPACK® SURVEY program out the serial or parallel ports or to a file. You can select which items to export from a set-up window and format the chosen items according to your needs. If this program is open when you close SURVEY, it will resume using the same settings the next time you launch SURVEY.

NOTE: If you want to output multiple sets of data, you can launch more than one incident of this module with different connection settings for each.

1. **Start the program by selecting OPTIONS-SHARED MEMORY-OUTPUT**. The Shared Memory Output window will appear.

FIGURE 3-27. *Shared Memory Output*

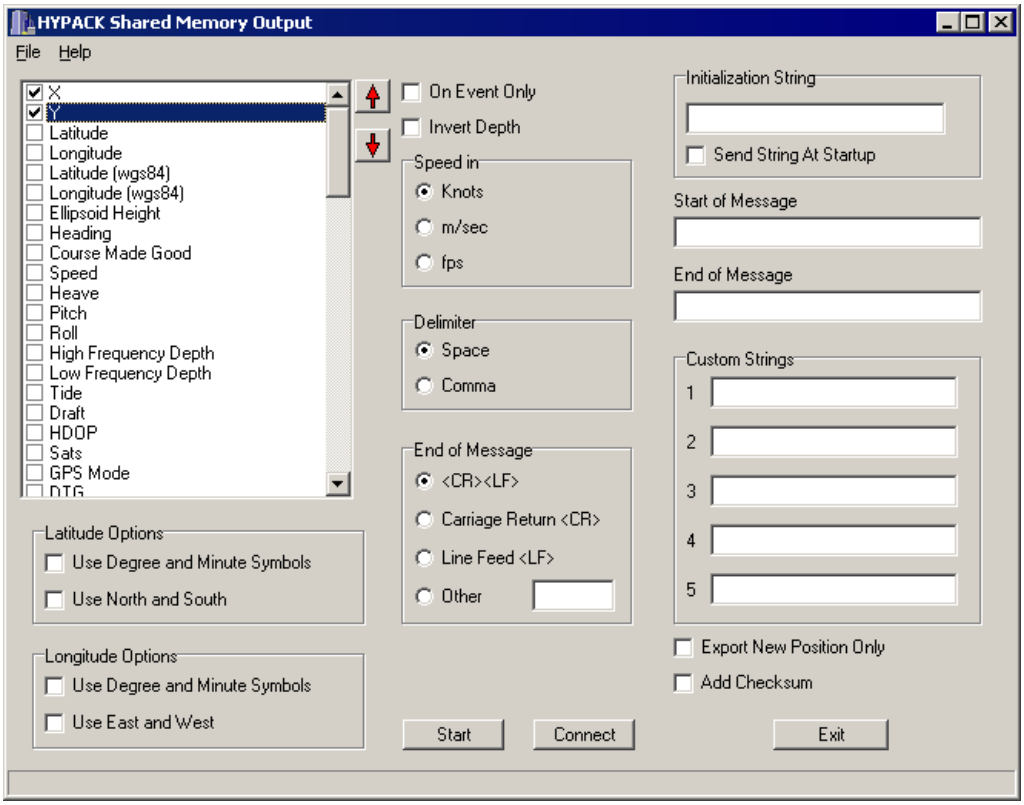


2. **Select and order your output data**.
3. **Set your output format and connection options**.
4. **Start the data output** by clicking [Start]. You can preview the data strings on the status bar at the bottom of the window.

SETTING YOUR MEMORY OUTPUT DATA

1. **Select each item you wish in your export string** by checking its box. You can also enter up to five custom strings which may then be selected when configuring your Shared Memory Output.
2. **Arrange the items in the order that they should appear in the exported data string**. You can reposition an item relative to another by:
   - selecting the item and using the up or down arrows
   - selecting an item and dragging it in the list.

FIGURE 3-28. Configuring the Shared Memory Output



SETTING YOUR MEMORY OUTPUT OPTIONS

All data available from SURVEY is listed in the left-hand side of the Shared Memory Output window.

The whole idea of Shared Memory Output is that you can create a custom output string. There are several output options to consider beyond the data you want to include in your output string:

- **The exported data string format** according to the needs of the receiving computer.
  - **Lat./Lon. Options** enable you to choose the format of the position information regarding degree signs and the use of N/S and E/W. At this time the only configuration is dd mm.mmm.
  - **Invert depth option:** If you are exporting depths and you want to invert them, check the box.
  - **Speed units:** Choose knots, meters/second, or feet/second.
  - **Select the delimiter**. Items in your output string can be separated by commas or spaces.
  - **Indicate what message should appear at the end of the string**. You have a choice of Carriage Return, Line Feed or both. If none of these suits your need, create one that does under Other.
  - If your device expects a **checksum**, check the box.
  - Enter the characters expected by your receiving device for the **start and end of the message**. The End of Message string from

the second column will appear immediately before the End of Message selection in the first column.

- The **Send Frequency**: You can send your string:
  - **At each reading** of any kind.
  - **At each new position reading** by checking the **Export New Position Only** box.
  - **Only on events** by checking the **On Event Only** box.

NOTE: Selecting both check boxes will result in no output.

- **Timer options** offer you the choice of using the:
  - **Windows® timer** , which is easily interrupted by certain interactions with the Windows® interface and is, therefore likely to be less accurate.
  - **Internal timer** is probably more accurate.
- **Initialization String options** enable you to configure and send an initialization string if you are outputting data to a recording device that first needs to be prepared in this manner.
  a. **Enter the initialization string** required by your device.
  b. **Send the string to your device.** Check the Send String At Startup box. This will automatically send the initialization string when you start the Shared Memory Output.
- **Tell the program where to send the message.** Click [Connect] to access the standard connect parameters as in the HYPACK® HARDWARE program.

FIGURE 3-29. *Serial and Parallel Connection Settings*

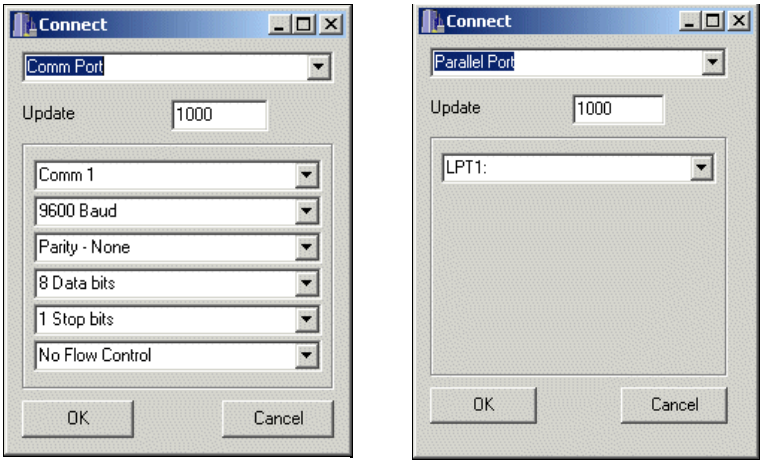
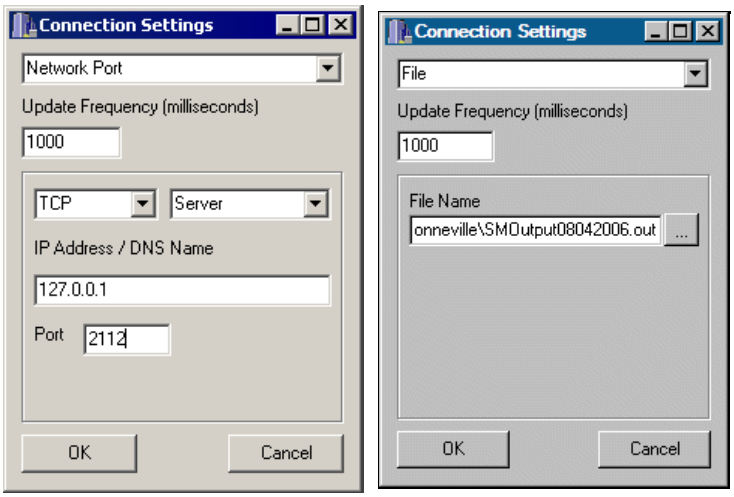


FIGURE 3-30. *Network and File Connection Settings*



c. **Select the output destination**. The data can be exported through either a parallel or serial port, to a file or over a network. If you connect to a file, the program will output to a text file with the *.OUT extension. The default filename will create a new, write-only file each day and the name will default to "SMOutput*Date*.out" (ex. SMOutput08042006.out). You may choose to name your own file. In this case, the program will continue to append data to that file until you change this setting.

d. **Provide the output information pertinent** to the destination.

e. **Specify the Update Frequency** (msec).

f. **Click [OK]** to return to the Shared Memory Output dialog.

BROADCASTING SURVEY DATA OVER THE NETWORK

If you save your Shared Memory Output settings to an .ini file and export your Shared Memory Output to the network, any network computer, including your own, can use the Shared Memory Input device driver (SMInput.dll) to read the data strings.

This requires that both computers have licensed versions of HYPACK® that can run SURVEY and the hardlock that goes with it.

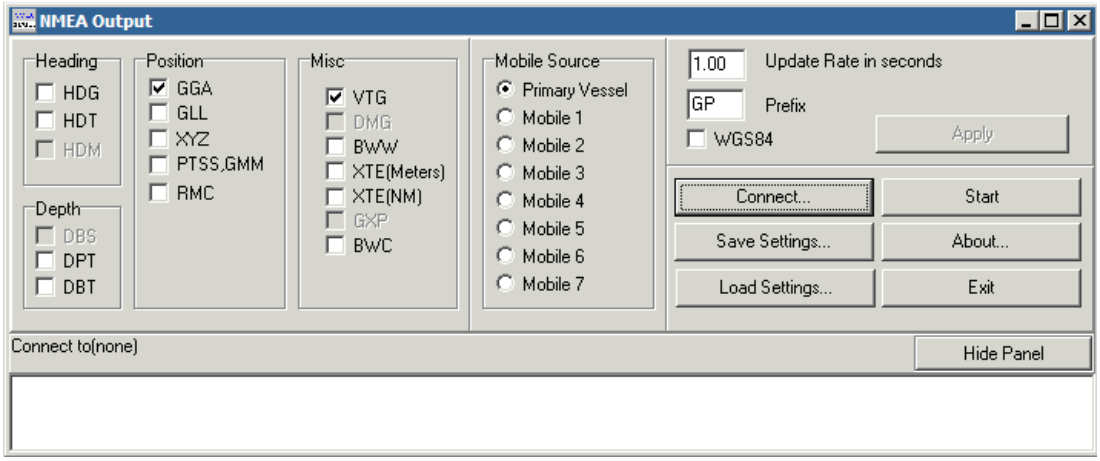
In this way you can run another incident of SURVEY, but read the data from Shared Memory instead of the devices themselves.

NMEA OUTPUT

NMEA Output enables you to export user-defined NMEA strings from the SURVEY program. It can be used together with the NetNMEA.dll to broadcast the output strings over the network. If you want to output multiple sets of data, you can launch more than one incident of this module with different connection settings for each. If this program is open when you close SURVEY, it will resume using the same settings the next time you launch SURVEY.

1. **Select OPTIONS-SHARED MEMORY-NMEA OUTPUT**.

FIGURE 3-31. NMEA Output Display



2. **Select which NMEA strings to export**. Checking the WGS84 option tells it to output WGS84 rather than local coordinates.
3. **Define the Update Rate** (the frequency to send messages).
4. **Define the Prefix.** This is typically GP, but can be anything.
5. **Set the connection information** by clicking [Connect] and filling in the dialog (as in HARDWARE).
6. If you plan on using multiple instances of NMEA OUTPUT, **save each series of settings to a named file**. In this way you can remember the settings for each instance by a name. Click [Settings] and provide a name. The settings will be saved. They can be recalled by clicking [Load Settings] and selecting the name from the drop down menu.
7. **Click [Start].** You can preview the output in the bottom of the screen or click on [Hide Screen] to remove this display.

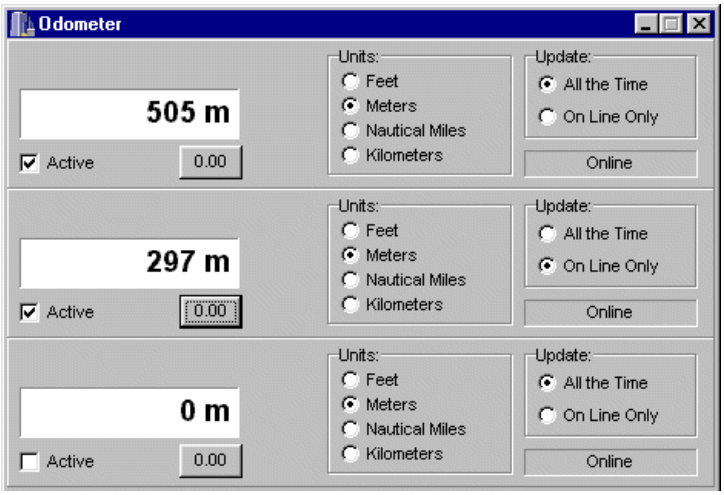
NOTE: The [Start] key changes to [Pause] when the program is exporting data. You can toggle the export of data on and off with this button.

ODOMETER

The Odometer program enables you to monitor the distance traveled. This is only for on-screen viewing; there is no data output. The program allows you to view up to 3 different configurations.

1. **Launch the ODOMETER program** by selecting OPTIONS-SHARED MEMORY-ODOMETER.

FIGURE 3-32. *Odometer Display*

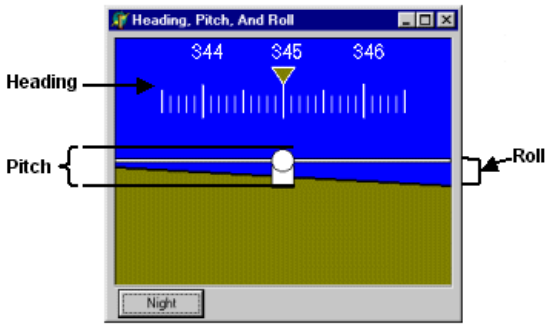


2. **Select the distance units**.
3. **Specify distance to measure**, all travel or only the distance traveled while surveying.
4. **Check the Active check box and view the distances in the windows on the left**. Toggle this measurement on and off manually by checking and clearing the box.

GRAPHICAL MOTION REFERENCE UNIT

The Graphical MRU program shows Heading, Pitch and Roll in a real time, visual display.

FIGURE 3-33. *Graphical MRU Display*



The scale at the top of the window represents the heading.

The vessel is represented by the square in the center. When the vessel:

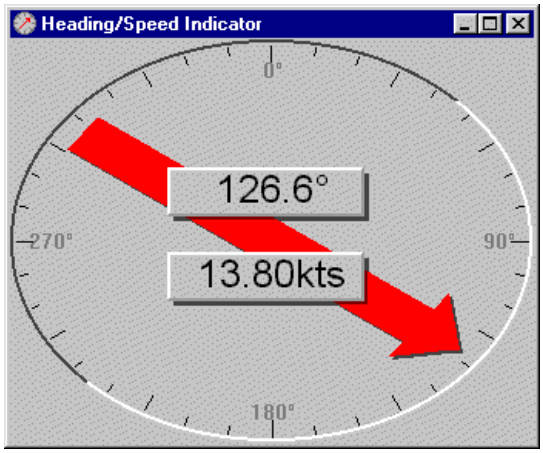
- **Is stationary**, the lines extending out on either side lie at the change from green to blue.
- **Rolls**, the diagram green/blue border rotates out of line with the horizon line by the amount of the roll.
- **Pitches**, the square moves vertically out of line with the circle by the amount of the pitch.

The Night button enables you to toggle between dark and light displays according to your survey environment.

HEADING AND SPEED INDICATOR

The heading and speed indicator is a graphical display of your vessel's heading and speed.

FIGURE 3-34. *Heading and Speed Indicator*



CONFIGURING YOUR AREA MAP DISPLAY

The SURVEY program loads the information from the current project. It gets geodetic information and hardware information by reading the project's initialization files. It will load the most recently used planned survey line file (*.LNW) from the current project, as well as any background files and matrix files that are currently 'Enabled'.

The HYPACK® SURVEY interface also enables you to load additional files and set other display options.

LOADING FILES TO YOUR AREA MAP DISPLAY

In addition to the files loaded based on the HYPACK® display, you can load files through the SURVEY menus.

- **Background Files** may be loaded using the CHART menu in the SURVEY shell. In addition to background chart files, you can also load several other HYPACK® file types (eg. BRD, CHN, MTX, LNW, PLN, TGT...) *for display purposes only.*
- **Planned Lines:** A planned line file may be loaded by selecting LINE-SELECT FILE and choosing your file. Since you may only have one line file loaded at a time, SURVEY will unload any active Line File and load the selected file. This will be the one on which the Cross Track Error, Distance from Beginning of Line and other such

measurements are based. You may display other planned line files as charts by loading them through the Charts menu.

- **Target Files:** A target file may be loaded through the Targets menu. You may only have one target file active in SURVEY at a time. This will be the one to which any new targets will be appended during survey. You may display other target files as charts by loading them through the Charts menu.
- **Active Matrix files:** Matrix files may be loaded through the Matrix menu. You may have multiple matrix files loaded at a time. You may also load matrix files *for display purposes only* through the Charts menu.
- **Corrected or Raw Soundings and/or Events** at each event mark. These items are stored in the current Project directory. Each day, separate Sounding and Event files are created. The SURVEY program automatically re-loads each file to provide you with a history of the day's survey.

Once displayed, you can toggle them on and off through the Layer Manager. Files loaded through the Chart menu will be preceded by "Chart".

AREA MAP DISPLAY CONTROLS

AREA MAP LAYER MANAGER

In addition to your project files, you may also include chart features, such as a legend, scale, north arrow, and projection and lat./lon. grids, in your area map display.

To set the files displayed and their draw order:

1. **Access the Layer Manger** by selecting SETTINGS-LAYER MANAGER.
2. **Check the files and features you want to display**.
3. **Set the draw order.** You can click and drag the files in the list or select one and reposition it with the Up and Down buttons. Items at the end of the list are drawn first and will be overlaid by any in the list above them that are selected.
4. **Click [OK]**.

FIGURE 3-35. A Sample Area Map

AREA MAP MENU OPTIONS

Print Output Menu:

- **Save Bitmap** saves a bitmap record of the current Area Map window to the project directory.
- **Print Map** sends a copy of the Area Map to the default Windows® printer.

View Menu:

Zoom In/Out: When this option is selected, a left-click decreases the scale (zoom in) and a right-click increases the scale (zoom out).

Zoom Window: Select this option and drag a rectangle in the window to define the extent of your desired view. The program will redraw the screen to display the defined area optimally.

Zoom Extents: When this option is selected the screen will be drawn at a zoom scale that displays all enabled data.

Pan: Select this option, then click in the window at the point around which the display should be centered. The display will redraw accordingly.

Move options (or the arrow keys) can be used to pan the screen.

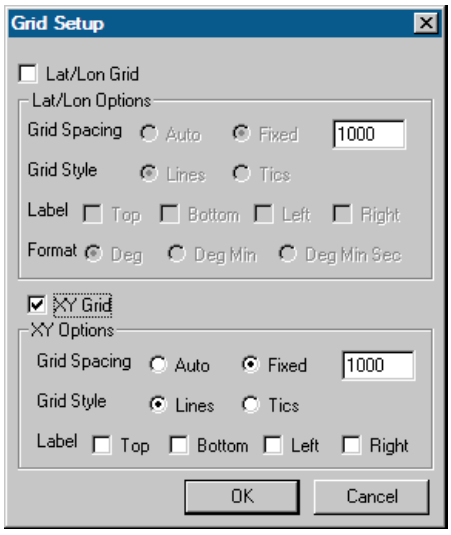
Rotate options turn the area map display.

AREA MAP GRID PROPERTIES

Grid Properties set how the projection and lat/long grids are presented. Select SETTING-GRID PROPERTIES to access the Grid Setup dialog. As in the HYPACK® Control Panel, you can choose automatic or fixed spacing and the style of the labels. Labeling is available on all four sides of the map.

NOTE The Lat-Long grid is displayed in Lat-Long of the local datum.

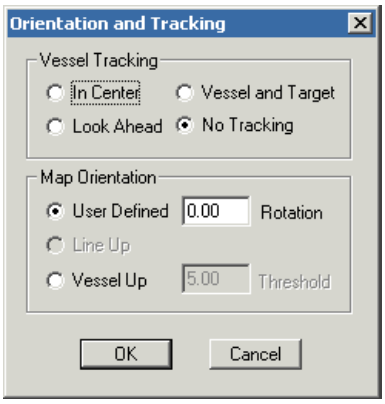
FIGURE 3-36. *Grid Setup Dialog*



AREA MAP TRACKING AND ORIENTATION OPTIONS

Tracking and Orientation options can be used to automatically re-adjust the screen when the boat leaves the display area and to rotate your map to your preferred orientation. These options are set independently for multiple Map displays. A handy feature for the helmsman who may want a closer view and different orientation than anyone else on the vessel.

FIGURE 3-37. *Tracking and Orientation Dialog*



Select MAPSETTING-TRACKING/ORIENTATION from the menu and the Orientation and Tracking dialog will appear.

Vessel Tracking:

- **In Center** returns the boat to the center of the screen as it nears the edge.
- **Look Ahead** moves the boat further back from the center to maximize the amount of space displayed ahead of the vessel.
- **Vessel and Target** keeps the boat and the current active target in view. The map automatically zooms to fit as you approach.
- **No Tracking** allows you to move the screen anywhere you want without having it zoom back to keep the boat in view. (Strike the Home key to center the vessel on your screen.)

If you set your preferred method of tracking, you can quickly toggle between this setting and “No Tracking” by selecting SETTINGMAP-TOGGLE TRACKING or by a simple click of the ‘T’ key.

Map Orientation:

- **Vessel Up** aligns the Area Map with the current vessel heading. Define a threshold (in degrees) to determine how much the vessel heading must change to cause the map orientation to adjust. This prevents constant (annoying) updates of the map orientation with only small changes in vessel heading.
- **Line Up** draws the screen so the current line segment is directly “up” the screen. If you are in the “Line Up” orientation, the boat should be progressing up the screen. If your boat is going “down” the screen, you need to “whip” the line ends (change the start-line and end-line points) by using the Ctrl-W key command or the LINE–SWAP menu item.
- **User-Defined Rotation** draws the Area Map according to the specified degrees. Zero degrees will orient the map with North up.

AREA MAP RANGE OPTIONS

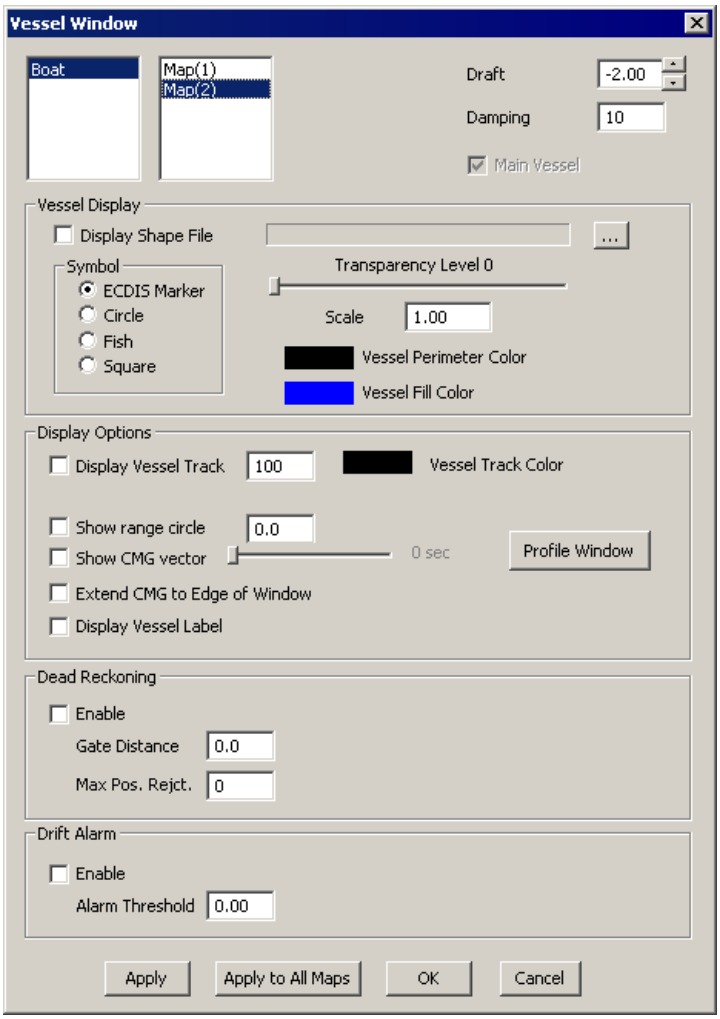
Range options on the Area Map tool bar allow you to quickly scale the map display. Just select a range in the SURVEY tool bar. SURVEY will automatically scale the selected Map window so the length of shortest side displays the selected real-world distance. Each subsequent window resize will adjust the scale accordingly, but any zoom action will cause the range to revert back to "none".

The default range values are 500, 1000, 2000, 3000, and 4000, however, you can modify them by entering a new list in the System tab of HYPACK® HARDWARE.

BOAT FEATURES IN HYPACK® SURVEY

You can configure the display options and draft correction for each vessel through a Vessel Setup dialog. In addition, each Map window can display the same vessels identically or differently, each according to its own vessel setup.

FIGURE 3-38. *Vessel Setup Dialog*



1. **Open the Vessels Setup dialog** by clicking VESSELS on the menu bar.
2. **Select the vessel whose features you want to modify and the Map window for which these settings apply** at the upper left.
3. **Choose your vessel settings and click [Apply].** The Apply button allows you to preview your display before exiting the dialog. If it doesn't suit you, make some adjustments and apply again.
4. When you are satisfied, **click [OK].**

The configuration for each vessel is saved when you exit the SURVEY program and are restored when you re-start the program.

SPECIFYING THE MAIN VESSEL IN SURVEY

For applications with multiple vessels or a vessel and towfish, one vessel must be set as the “Main Vessel”. The main vessel is used for calculating

Cross Track Error and Distance To Go information. It is also used for the automatic Start Line and End Line decisions.

To set your selected vessel as the Main Vessel:

1. **Open the Vessels Setup dialog** by clicking VESSELS on the menu bar.
2. **Select the vessel whose features you want to modify** at the upper left.
3. **Check the 'Main Vessel' option.** Checking this box will automatically clear this option for any other vessel.

NOTE: The selected vessel will be the main vessel in *all* Map windows.

TIP: If you are tracking an ROV or using a towfish, you probably want to make the ROV or towfish the main vessel.
For applications with multiple vessels or a vessel and towfish, one vessel must be set as the "Main Vessel". The main vessel is used for calculating Cross Track Error and Distance To Go information. It is also used for the automatic Start Line and End Line decisions.

To set your selected vessel as the Main Vessel:

1. **Open the Vessels Setup dialog** by clicking VESSELS on the menu bar.
2. **Select the vessel whose features you want to modify** at the upper left.
3. **Check the 'Main Vessel' option.** Checking this box will automatically clear this option for any other vessel.

NOTE: The selected vessel will be the main vessel in *all* Map windows.

TIP: If you are tracking an ROV or using a towfish, you probably want to make the ROV or towfish the main vessel.

BOAT SHAPES AND SYMBOLS IN SURVEY

When the SURVEY program first loads a new vessel, it will default to a circle symbol.

Assigning a Boat Shape

You can assign a custom Boat Shape, created in the BOAT SHAPE EDITOR (*.SHP) to a vessel through the vessel setup dialog.

1. **Access the Vessel Setup dialog,** select VESSELS in the menu.
2. **Select the vessel whose features you want to modify and the Map window for which these settings apply** at the upper left.

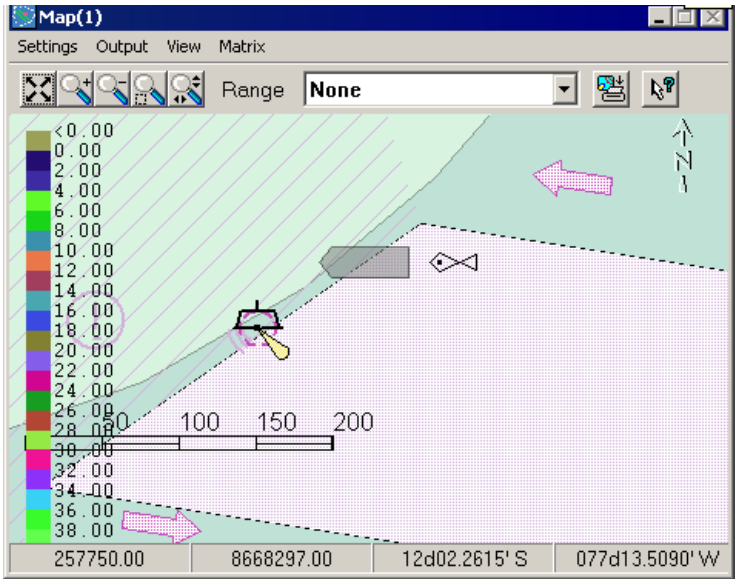
3. **Check the 'Display Shape File' option and click the [...] for the Shape field.** It will bring up a listing of the available shapes, defaulting to the \Hypack_2011\Shapes folder.
4. **Select the vessel shape file** that represents your vessel and click [Open]. Multiple file types are supported:
   - SHP files: The default file type is created in the BOAT SHAPE EDITOR
   - DXF files, typically drawn in a CAD program, with the 0,0 point at the boat origin.
   - BMP files

To display the boat shape instead of the symbol, clear the 'Display Shape' check box.

If a boat does not have a shape associated with it, it will be drawn with either a circle, box, fish or an ECDIS boat symbol. You can select the one you want from the Symbol list.

In the following figure, we selected the BOAT.SHP (custom shape found in the \Hypack_2011\Support\Boat Shapes folder) for our main vessel. For the ROV, we have selected a Fish shape from the SHAPE options.

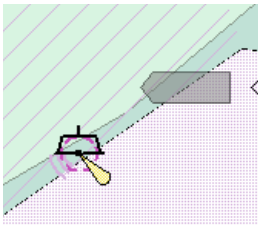
FIGURE 3-39. *Main vessel and towfish shapes and symbols in SURVEY*



You may distinguish between different vessels by assigning different symbols, shapes or fill colors, or by displaying vessel labels.

Vessel Shape Transparency

A transparent shape allows you to view items (such as chart information, soundings, planned lines, etc.) that may otherwise be obscured from view by the boat shape.



To change the level of transparency, use the transparency slider. The level is displayed above the control and updates as you move the slider.

Vessel Shape Scale

Scale affects the size of the vessel shape displayed. Enter a scale multiplier in the Vessels Setup dialog to adjust the size of your vessel in the Map window.

TIP: If you use real measurements in the BOAT SHAPE EDITOR when you generate your boat shape, a scale of 1 should display your vessel at a proper scale in SURVEY.

Vessel Perimeter Colors

The **Vessel Perimeter Color**.defines the color of the vessel symbol, the outline of the boat shape that may be assigned to this vessel, as well as the color used to display text information about the boat in the Data Display.

NOTES: If you have multiple vessels, you can keep track of different ones by assigning different perimeter colors for each vessel.

If you have multiple map windows, the vessel perimeter color will be the same in all of the map windows because it corresponds to the text in the Data Display.

The **Vessel Fill Color** is the color used to fill a boat shape. Note the fill color is independent of the symbol color and can be different for the same vessel in different Map windows.

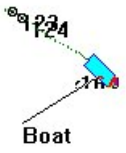
To assign either the perimeter or fill color, click in its color square and select a new color from the color selection dialog.

Labeling your Vessels

It may be useful, when tracking multiple vessels, to place a short label on the vessel.

To label your vessels, check the‘Display Vessel Label’ option.

FIGURE 3-40. *Labeling the Boat*



NOTE: Vessel names (determined in the hardware setup) should be kept short, as the SURVEY program needs to capture the entire area surrounding the boat and label. If boats and labels overlap, the display can get confused as it captures pieces of other labels. This can be re-set by zooming the screen in/out one time.

More Information

- "Using Bitmap Images as Boat Shapes" on page 10-120

BOAT TRACK PARAMETERS

The track parameters are the settings that affect the calculation and display of the boat track line in SURVEY.
The **track line** shows the path that the vessel has traveled.

To display the track line:

- Check **Display Visible Track** and set the **track length.** This is the number of updates included in the display. (More updates results in a longer displayed track line.)
- Set the **track color** by clicking in the **Vessel Track Color** square and selecting your color from the Colors dialog.

Show CMG (Course Made Good) **Vector** draws a line that projects the future path of the vessel from the tracking point using the current heading and speed. Set the length (in seconds) of the vector using the corresponding slide. **Extend CMG to Edge of Window** overrides the length set with the slider and draws the vector to the extent of the window.

To display the CMG Vector:

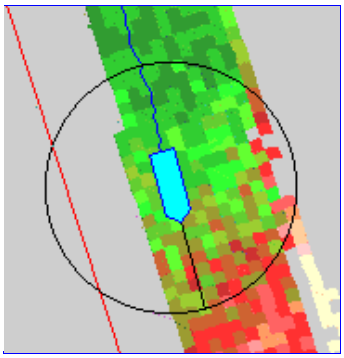
- **Set the damping.** Damping is the number of previous position updates used to calculate the ship speed and course made good. The Speed and Course Made Good (CMG) are normally taken from external devices. If there is no external Speed or CMG device, the SURVEY program will calculate these.
- **Set the vector length** with the Show CMG Vector slider or the Extend CMG to Screen Limit check box.
  - **The CMG Vector slider** sets the length of the vector line in seconds. The time span is displayed at the end of the slider and updates as you move the slider. An entry of zero draws no vector. An entry of 20 will draw a vector from the tracking point to the position at which the tracking point will be in 20 seconds if the vessel continues at the same heading and speed.
  - **Extend CMG to Screen Limit** overrides the distance entered with the CMG Vector slider. Check this option and the vector will extend to the edge of the Area Map window.
- **Check the 'Show CMG Vector' option** .

A **guard circle** is a circle drawn at a user-defined distance around the vessel tracking point.

To draw a range circle:

1. **Check 'Show range circle'**.
2. **Enter the radius**, in survey units.

FIGURE 3-41. Boat shape with track, vector and range circle



POSITION FILTERS IN SURVEY

GPS devices can occasionally generate an inaccurate reading. Position spikes such as this may cause a problem for users who are using automated features such as switching planned line segments, cross-track error, and Start and End Line Gates to control data logging in SURVEY. The position filters in the Vessel Setup dialog provide criteria for SURVEY to recognize a bad position and ignore it *for these purposes*.

1. **Open the Vessels Setup dialog** by clicking VESSELS on the menu bar.
2. **Select the vessel whose features you want to modify and the Map window for which these settings apply** at the upper left.

The **Dead Reckoning** option tells SURVEY to calculate a position based on current heading, speed and elapsed time since the last position, and use it in place of a rejected position.

Gate Distance is the maximum distance allowed between two consecutive positions when the vessel is stationary. Each time SURVEY receives a position, it calculates the distance it should be from the last recorded position based on the vessel speed and elapsed time since the last position. It compares that calculated distance against the actual distance. If the actual distance exceeds the calculated distance by more than the gate distance, SURVEY records the position to the data file, but ignores it for the purpose of the automated features in SURVEY.

Use a value slightly larger than your expected GPS error.

Maximum Consecutive Positions Rejected limits the number of points that can be rejected without accepting one. If SURVEY has rejected this number of consecutive position readings, it will accept the next position regardless of where it is.

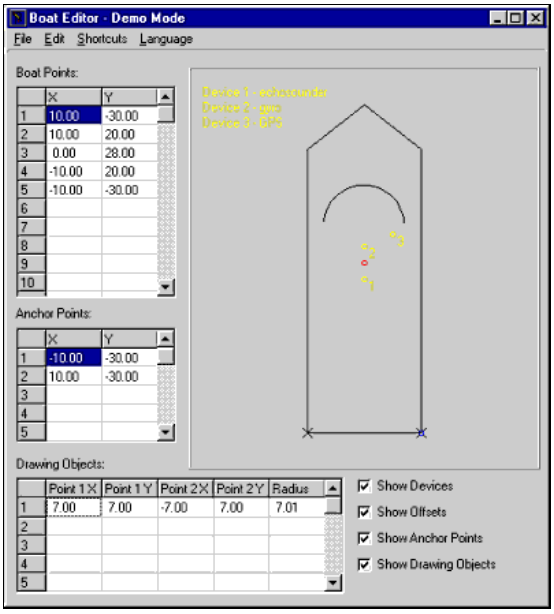
Calculate the number of positions you would normally log over the distance where you lose signal and use a value slightly greater.

ANCHORS IN SURVEY

Up to nine anchors can be attached to your boat shape using the BOAT SHAPE EDITOR routine. The “Boat Points” are entered by typing the X-Y distances (in the same units as your survey projection) from the boat origin to various points along the perimeter of the vessel.

In the BOAT SHAPE EDITOR, you can attach anchors to the shape. These anchors will be referred to as “Anchor 1, Anchor 2, …., etc.” in the order they have been entered.

FIGURE 3-42. *A Sample Boat Shape in the Editor.*



Dropping and Raising Anchors

Once you have loaded your boat shape file with anchors attached, you can drop and raise its anchors in all of themap windows.

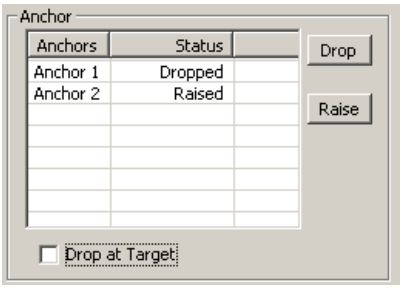
This can be done through :

- **The keyboard shortcut:** Hold Alt and a number key that corresponds to the anchor number. (For example Alt+1 drops Anchor 1.) You can raise the anchors in the same manner.

  NOTE: If you have more than 1 vessel with anchors, this affects the main vessel only.

- **The Vessel Setup dialog**
  a. **Open the Vessel Setup Dialog** by selecting VESSELS. The setup dialog for vessels configured with anchors includes a set of anchor controls.
  b. **Select the vessel whose anchor you want to control**.

FIGURE 3-43. Anchor Controls in the Vessel Setup Dialog



c. **Select the anchor number you want to drop then click [Drop] or [Raise].** The anchor will be dropped or raised, respectively, at the current anchor position and displayed on the screen.

NOTE: This method is useful if your display includes more than one boat shape with anchors as it enables you to choose the vessel whose anchors you affect.

- Check **Drop at Target** to drop the anchor at a *selected* target location rather than at the current anchor location.

Displaying the Distance to an Anchor

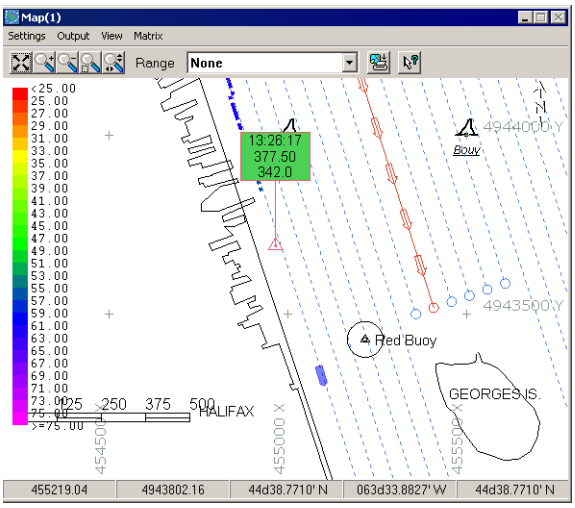
You may display the horizontal distance from an anchor to its attachment point on the vessel by right clicking on an anchor. In the popup display, "L=" will display the horizontal distance in the current survey projection units. Right click on the L= equation to label the anchor with a distance label that is updated in real time.

CHART (BACKGROUND) FILES

The SURVEY program loads the information from the current project. It gets geodetic information and hardware information by reading the project's initialization files. It will load the most recently used planned survey line file (*.LNW) from the current project, as well as any background files and matrix files that are currently "Enabled".

In addition to background chart files, you can also load several other HYPACK® file types in SURVEY (eg. BRD, CHN, MTX, LNW, PLN, TGT...) *for display purposes only.*

FIGURE 3-44. *SURVEY with a Target File as Background File (Red Buoy) and an Active Target File (13:26:17).*



LOADING CHARTS DURING SURVEY

1. **Select CHART–LOAD**. A file selection window will appear.
2. **Select the desired file type and the name of the data file you wish to add to the SURVEY Area Map**.

NOTE: Vector Product Format charts may also be loaded from SURVEY through the Chart menu. The process is the same as loading them to HYPACK®.

Chart Geodesy: For Chart data to be correctly drawn, the geodetic parameters of HYPACK® must match the geodetic parameters of the background file (BSB, DIG, DGN, DGW, DXF, TIF, ARCS). For data stored in WGS-84 (C-Map, S57, VPF), the SURVEY program will transform the data files to the local datum, using the datum transformation parameters in the GEODETIC PARAMETERS program before converting them to your projection. This allows you to use these file formats on any projection.

Draw Order: Charts inside the SURVEY program will draw in the order they have been loaded. If you have a Chart which has a solid background (e.g. BSB, S57, TIF, VPF), these will obliterate other types of background charts. To view both charts together, you must do either of the following:

- **Specify the the correct draw order.**
- **Set the transparency setting** of the file drawn on top to allow you to see through to the files below.

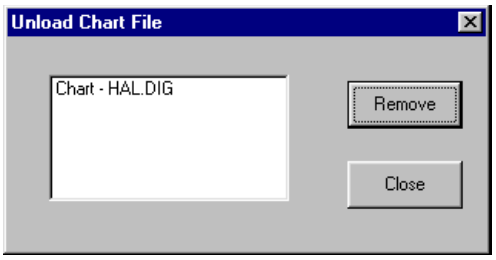
More Information

- "Unloading Charts during SURVEY" on page 3-43
- "Setting Chart Display Order" on page 1-42
- "Setting Chart Transparency" on page 1-41

UNLOADING CHARTS DURING SURVEY

1. **Select CHART–UNLOAD**. The window shown in the following figure will appear.

FIGURE 3-45. *Unload Chart File Window*



2. **Click on the file you wish to "Unload" and click [Remove].** The screen will now redraw without the file you have "unloaded".

DISPLAYING HAZARD CONTOURS

A **Hazard Contour** (also known as a safety contour) is a user-defined contour level that warns of depths unsafe for navigation.

When you display contours exported from the TIN MODEL program, the hazard contour can be set to draw in red in the SURVEY Map window. More than one DXF file can be affected by the Track Hazard Contour setting.

During SURVEY, the program monitorschanges in your real-time tide and draft corrections, and shifts the red contour up or down accordingly.

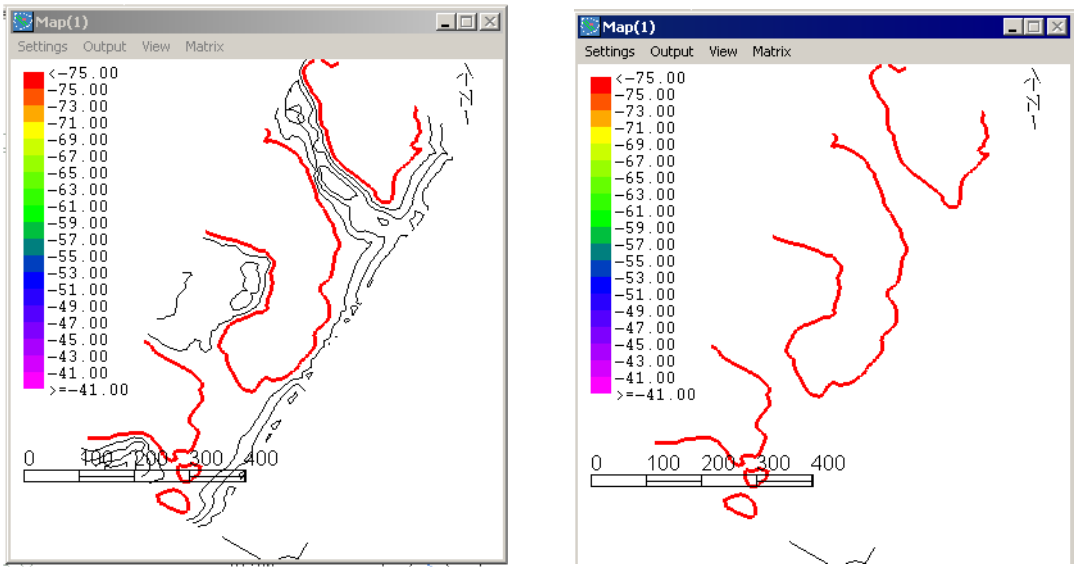
NOTE: The Hazard Contour setting affects *only* DXF contours constructed in the TIN MODEL program.

1. **Load one or more DXF files to SURVEY.**
2. **Select TIDE-CONTOUR.** The Track Hazard Contour dialog appears.

FIGURE 3-46. *Track Hazard Contour Dialog*

3. **Enter the hazard contour level** when the tide is at zero for your project area.
4. **Choose which contours you want to display**.
   - **Hazard** contour shows in red
   - **Shallow** displays the hazard contour in red and all shoaler contours in gray.
   - **All**: Shows all contours from your files with the hazard contour in red.
   - **None**: Shows all contours from your files, but the hazard contour is not drawn in red.
5. **Preview your results (**Optional) by clicking [Apply].

FIGURE 3-47. *Hazard Contour - Shallow (left), Hazard (right)*



6. **When you are satisfied with the results, click [OK]** to return to SURVEY.

TARGETS IN SURVEY

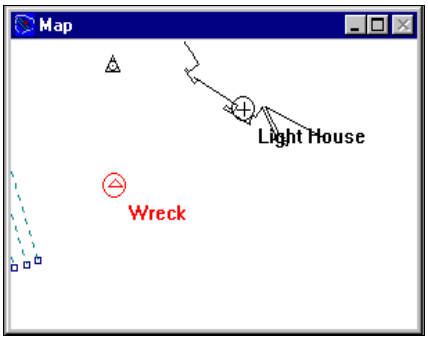
A target represents a location and a name. In HYPACK®, targets can be used to mark navigation aids (buoys, beacons, etc.), or locations where you take water quality or bottom samples, or the “Waters Edge” location when surveying on rivers.

When you mark a target, SURVEY will draw it to the area map and store it to the target file enabled in the project. If no target file is enabled, the program automatically creates a target file named with the format mmddyyyy.TGT (where “mm” is the month, “dd” is the day and "yyyy" is the year) and stores it in the current Project directory. For example, if a target is marked on October 25th, 2000, it is stored to a target file named 10252000.TGT.

NOTE If you are working past midnight, the same target file will remain open and active until you change it or exit and re-enter SURVEY.

To specify that the target file be saved to a directory other than the project directory, select OPTIONS-PROJECT INFORMATION, check "Override Target Path" and specify the alternate directory.

FIGURE 3-48. *Targets in an Area Map*

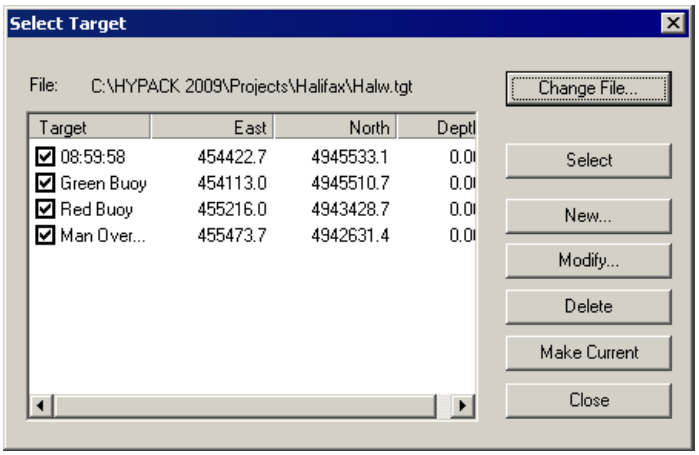


LOADING A TARGET FILE IN SURVEY

You may have only one target file active in SURVEY at a time. If you have one or more target files displayed in the HYPACK® screen, SURVEY automatically loads the first enabled target file listed in the Project Files list. You can load an alternate target file in SURVEYthrough the Targets menu.

1. **Select TARGETS–SELECT** and the Select Target dialog will appear.

FIGURE 3-49. *Select Target dialog*



2. **Click [Change File] and then select the desired target file (*.TGT)**. A list of targets will then be displayed in the large window.
3. **Mark each target you want to have displayed in the Area Map.** You can select a target by checking its checkbox or by selecting it and clicking [Select]. You can also use the Ctrl or Shift keys to multiselect targets, then click [Select] to toggle their checks on/off.
4. **Click [Close]** to close the dialog and drawthe selected targetsin the Area Map window.

NOTE: You can edit your target file by selecting the target and clicking [Delete] to remove the target from the file, or [Modify] to change the name or location of the selected target.

SELECTING TARGETS IN SURVEY

The Area Map can display several targets simultaneously. It can also calculate the distance and bearing to a specific target.

To select a target.

- **Use the right-click menu:** Right-click on the desired target and click on “Select”. The selected target is drawn with a triangle at its center while other targets are drawn with a “plus” sign at their center.

FIGURE 3-50. *Right Clicking on a Target displays the Target Selection Menu.*

Or

- **Use the Select Target dialog:**
  a. **Select TARGETS-SELECT**. The Select Target dialog displays a list of targets in the active target file.
  b. **Select the desired target in the list and click [Make Current].**

MARKING TARGETS IN SURVEY

Targets can be marked in the SURVEY program by:

- **Selecting TARGET–QUICK MARK** (or F5 key), a target is marked at the current tracking point position.
- **Double-clicking anywhere on the Area Map window**, a target is set at that position.
- **Selecting TARGET-SELECT and clicking [New] in the dialog**. The Target Properties dialog will appear for you to enter the necessary data.

The name of a target defaults to the computer clock time at which a Target was marked.

Each time a target is created in SURVEY, it is saved to the current target file.

ERASING AND RESTORING TARGETS IN SURVEY

You can display only selected targets from a loaded Target file by "erasing" (and restoring) selected targets from the display.

To remove a target from the Area Map without deleting them from the Target file by:

- **Right-clicking on it and then clicking the "Erase"** menu item.
- **Selecting the target and then TARGETS-ERASE CURRENT**.
- **Select TARGETS-ERASE ALL**.

The target is still stored in the Target (*.TGT) file and can be restored to the screen.

To restore an erased target:

1. **Select TARGET–SELECT** from the main SURVEY menu. The Target Properties dialog will appear.
2. **Click on the target you want to affect and click [Select].** Survey will display all targets that are marked with a "+" to the left of the target name.

TARGET PROPERTIES IN SURVEY

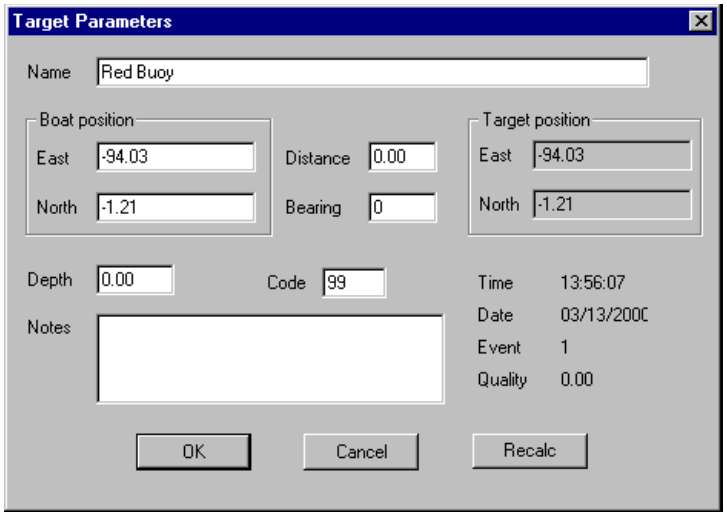
You can access the Target Properties dialog by:

- Right-clicking on a Target and selecting the “Properties” item

- Selecting TARGET–PROPERTIES from the menu
- Selecting a Target and hitting F6.

You may edit the Target Properties just by typing in the new information.

FIGURE 3-51. *The Target Properties Dialog*



The **Name of a Target** defaults to the computer clock time a Target was marked.

The **Boat Position** and **Target Position** can be displayed in either X-Y or Lat-Long. This is changed with the OPTIONS–TARGET PARAMETERS menu.

The **Boat Position** is the location of the tracking point when the Target is marked using the Quickmark function. If the Target was created in the Target Editor it will be the same as the Target Postion.

Distance and Bearing settings enable you to offset a Target from the marked location. It will be displayed in the new position with a line connecting it to the original position to show the offset.

The **Target Position** is the actual location of the Target, offsetting it by the Distance and Bearing entered from the tracking point.

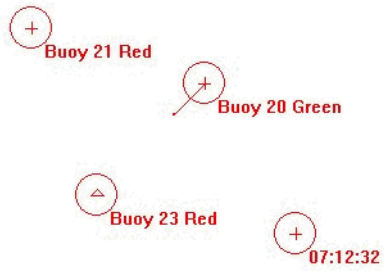
The **Depth** represents the corrected depth at the time the Target was marked.

The **Code** and **Notes** fields are available to you for whatever purpose you desire.

Time, Date, Event, and **QUA** data are saved for each Target as it is created.

In this figure, Buoy 23 Red is the current selected target, noted by the triangle in the center. Buoy 20 Green has been offset 100’ at a bearing of 045 degrees. A vector is drawn from theboat origin to the Target Position and the Target Circles are centered about the Target Position.

FIGURE 3-52. Displaying an Offset Target (Buoy 20 Green)

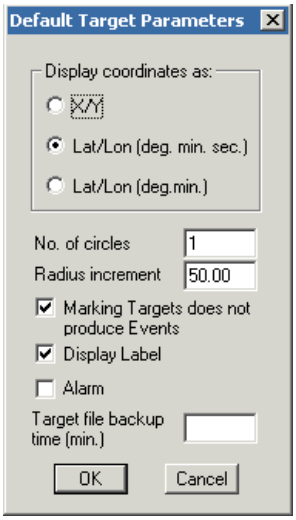


TARGET DISPLAY DEFAULTS IN SURVEY

To set the Target Display defaults:

1. **Select TARGETS-TARGET PARAMETERS**. The Default Target Parameters dialog will appear.
2. **Set your options and click [OK]**.

FIGURE 3-53. Default Target Parameters



The **Display Format** for the position coordinates can be XY, or Lat/lon in either of two formats.

Number of Circles draws concentric circles around the Target. The **Radius Increment** defines the distance between the target location and the first circle and the distance between each circle.

Making Targets does not produce Events prevents events at target locations. Clear this option to produce events when targets are created.

Display Label toggles the display of the target name when a circle target is created. Too many target labels may clutter your display.

Alarm adds a text box display for each target with the Target Name and the Distance and Bearing from the vessel's tracking point. (Example)

The text box changes color, according to the alarm distances set in the Target tab of the HYPACK® Control Panel. The default colors are green (low), yellow (medium caution) and red (danger), but you can set your own colors using the SCHEME BUILDER program.

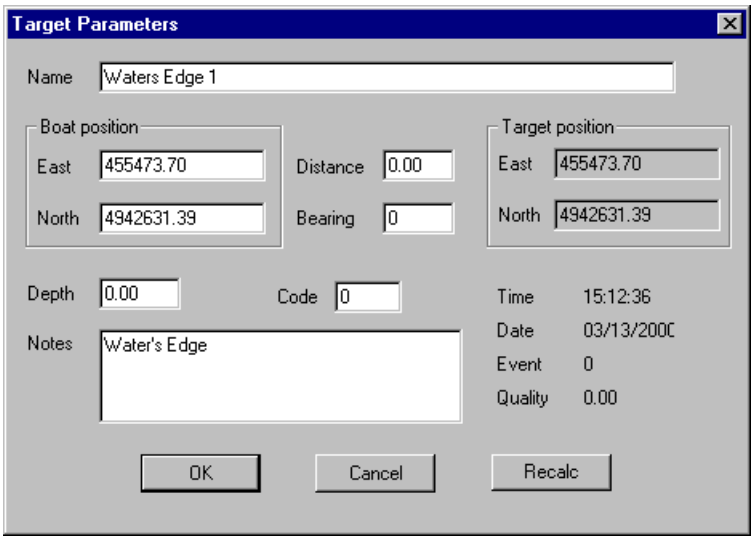
NOTE: This Alarm setting overrides the setting in the Control Panel, Targets tab.

If alarm flags overlap or if they are obstructing your view of other critical features in your area map, you can modify the positioning of the flag through the Target Properties. (Right click the target whose alarm flag you want to modify, select Properties and change the Orientation setting.)

Target file backup time saves the data to your target file and evenly spaced time intervals. This protects your target data from loss in the event of unexpected power interruptions. If no time is entered, the file will automatically save when you exit SURVEY.

WATER'S EDGE TARGETS

FIGURE 3-54. *Water's Edge Target Parameters*



The Water's Edge option creates a special kind of target used to mark the river bank when running lines perpendicular across the river.

NOTE: It is not accurate for use in volumes calculations. A straight line will be drawn from the last logged point to the Water's Edge target.

1. **Select TARGETS-WATER'S EDGE (F7)** and the Water's Edge dialog will appear.
2. **Mark Start of Line**.n
3. **When you are Off-Line, approach the river bank** at the end you want to start in the opposite direction of planned travel.

4. When the boat can approach no closer, **press the F7 key** (or use the menu). A Water's Edge Target Parameter menu will appear.
5. **Enter the distance from the tracking point to the river bank.** The program will calculate the X-Y point of the river bank and store this location in memory with a depth of "0.0" and bearing opposite your planned line. When you maneuver the boat and go "On Line", the SURVEY program writes this Water's Edge record as the first depth in the data file.
6. **Maneuver the boat and go "On Line",** the SURVEY program writes this Water's Edge record as the first depth in the data file.
7. **Mark End of Line**.
8. When you are On-Line and approaching the far bank, **proceed as close to the bank as possible and press the F7** key (or use the menu).
9. **Enter the Distance from the tracking point position to the riverbank.** The program calculates the X-Y of the river bank and saves this as the last record in your data file with a depth of "0.0". It then closes the data file and selects the next data file in the queue.

CONNECTING TARGETS WITH SURVEY LINES

You can create a single-segmented survey line wherever you need one--right in SURVEY.

1. **Create two targets, one at each end of the line** you need.
2. **Select the Target to which you want to draw the line**.
3. **Right click on the Target that you want to draw the line from and select "Line to Current"**. A survey line will be drawn between the indicated Targets and added to the currently selected Planned Line File.

FIGURE 3-55. *Drawing a Survey Line Between Two Targets*

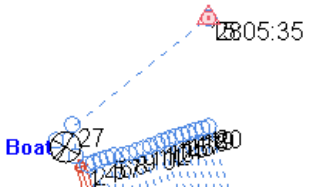
CONNECTING TARGETS TO THE BOAT POSITION IN SURVEY

If you have a planned line file enabled, you can create a survey line from your tracking point position to a target. Just right-click on the target and select 'Line to Vessel'. A survey line will be drawn between the indicated

target and your vessel, and added to the currently selected planned line file.

NOTE: This option is disabled if there is no planned line file enabled.

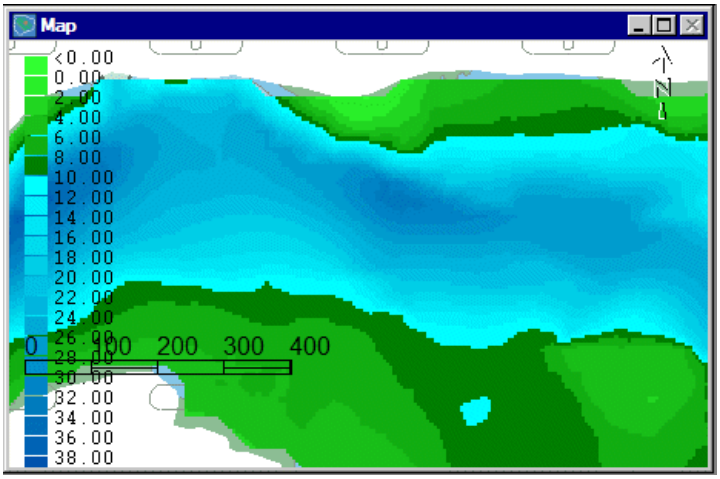
FIGURE 3-56. *Drawing a Survey Line Between a Target and the Boat Position*



MATRIX FILES IN SURVEY

Matrix files (*MTX) are gridded rectangular areas. You can fill the cells with depth information from your echosounder or dredge cutting tool in real time during data collection, or in post-processing.

FIGURE 3-57. *Matrix File in SURVEY*



Matrices can be filled in the survey programs to provide a coverage diagram. This is particularly useful for multibeam and multiple transducer surveys.

Matrix files can be saved at even time intervals by setting a Matrix Backup Time in the navigation parameters.

NOTE Be aware that there are limits to the maximum size of a matrix that can be successfully used in SURVEY. The maximum size depends on the amount of RAM, free hard drive space and processing power on your computer. Users with very large project areas should consider creating multiple matrices.

LOADING AND UNLOADING MATRIX FILES

If matrix files (*.MTX) have been enabled in the HYPACK® project screen, they will be automatically loaded into the SURVEY program. You can also “Load” and “Unload” matrix files in real time.

To load a matrix file:

Select MATRIX-LOAD and select the Matrix File from the project selection dialog.

If you have loaded a "filled" matrix and wish to remove the sounding data, select MATRIX-CLEAR CURRENT DATA.You can choose to save the data to a backup matrix file in the project's backup directory or just discard it.

NOTE If you clear the data, you can not later use the MATRIX-SHOW ORIGINAL DATA option to compare previous data from the survey area with current ones.

To unload a matrix file,

Select MATRIX-UNLOAD.

NOTE You should be aware that there are limits as to the maximum size of a matrix that can be used successfully. The maximum size depends on the amount of RAM, free hard drive space and processing power on your computer. If you are working in a very large project area, consider creating multiple matrices.

More Information

- “Multiple Matrix Files” on page 3-53

MULTIPLE MATRIX FILES

In certain projects, it may be advantageous to have a series of smaller matrix files, rather than one huge matrix file. It is more efficient for the program to concentrate on one, small matrix file at a time and automatically change from one to the other according to the vessel position rather than to manage and re-draw one matrix that is hundreds of megabytes in size.

The SURVEY program will load multiple matrix files. It will display and update any matrix while the main vessel falls within its boundary. As the vessel moves through the project area, the program will continue to load and unload the individual matrix files, depending on its location.

Note that only one matrix can display data at a time while you are logging data. All matrices may be displayed simultaneously (complete with

sounding data) only when you are not logging data by selecting MATRIX-DISPLAY ALL MATRICES.

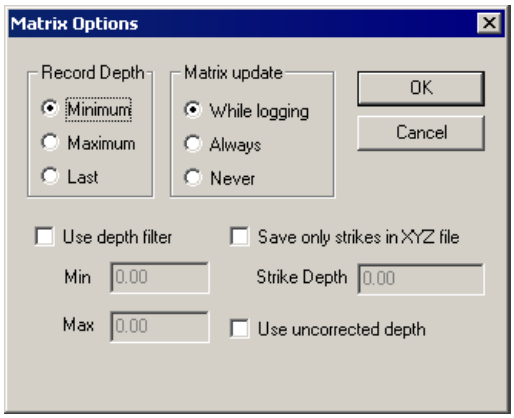
SAVING SOUNDINGS TO A MATRIX IN SURVEY

As you log data to a matrix during SURVEY, you can 'paint' either an empty matrix with only the current survey data or a matrix filled with data from a previous survey.

If you begin with a filled matrix, the new sounding data will overwrite what was previously entered.

The soundings you record to the matrix will be saved according to the criteria set in the matrix options. Select MATRIX-OPTIONS and the Matrix Options dialog will appear.

FIGURE 3-58. *Matrix Options Dialog*



Record Depth determines the depth reading to be stored to each Matrix Cell. Note how they are affected by Elevation or Depth Mode that you have set in the Matrix Menu.

Minimum will record the smallest depth value received in that cell.

- **In Depth Mode**, , the smallest value is at the shoalest point.
- **In Elevation Mode**, the smallest value is at the deepest point.

Maximum will record the largest depth value received in that cell.

- **In Depth Mode,** the largest depth is deepest, while the smallest depth is shoalest.
- **In Elevation Mode**, the largest depth is shoalest, while the smallest depth is deepest.
- **Last** will record the last sounding received.

Use Depth Filter option can be used to eliminate depths outside a user-defined range (Min Depth to Max Depth) from being saved to the matrix. This function can be used in either Depth or Elevation Mode. Since soundings are output as positive values, the Min. and Max values are always positive and the depths saved will fall in that range.

Save only strikes in XYZ file: When you select MATRIX-SAVE TO XYZ, it saves the difference between the sounding value and the user-defined Strike Depth. This is useful to see how much must be dredged to level the area to the strike depth.

- **If selected in depth mode**, it only saves sounding if the Z-value of the As Dredged Depth is less than the Strike Depth. In this case, it saves the difference of the Strike Depth minus the Z-value of the As Dredged Depth
- **If selected in elevation mode**, it only saves sounding if the Z-value of the As Dredged Depth is greater than the Strike Depth. In this case, it saves the difference of the As Dredged Depth minus the Z-value of the Strike Depth
- **If unselected**, this option saves all depths.

Beware!

BEWARE! This function is influenced by the Elevation Mode setting. If you are in Elevation Mode, this will record depths deeper than the strike mode. Probably not a very useful set of data!

You may also choose a Matrix Update Basis. You can choose to update your Matrix as follows:

- **Always** updates your Matrix continuously. This option enables you to follow your dredging in the Matrix while not recording the Raw data if you don't need it.
- **While Logging** updates your Matrix only when you are logging Raw data.
- **Never** causes the program not to update the Matix with "As Dredged" depths.

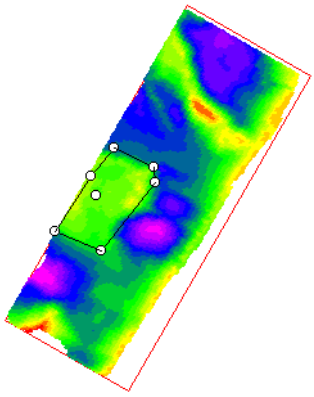
Use Uncorrected Depths: The Matrix is updated, by default, with corrected depth information. If your device outputs corrected data, check 'Use Uncorrected Depths' to avoid double corrections in the matrix.

Dredge Data in Empty Cells: This option, available only in DREDGEPACK®, enables you to paint matrix cells in DREDGEPACK® even if they contain no survey data. Use this option to paint an empty matrix or when you are working beyond the filled area of the matrix.

EDITING MATRIX DEPTHS WITH A BORDER FILE IN SURVEY

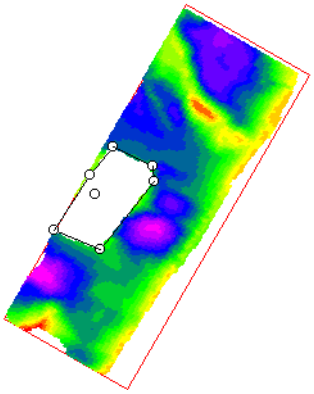
1. **Create a Border File** describing the area you wish to edit. You can:
   - **Create it in the BORDER EDITOR** and load it into DREDGPACK by selecting MATRIX-LOAD BORDER.
   - **Create it in DREDGEPACK®**. Select MATRIX-CREATE BORDER. Click as many points as you need to outline your area then right-click either inside or outside of the border you have created according to which portion of your data you want to modify. The polygon will automatically connect the first and last left-clicked points.

FIGURE 3-59. *Border File superimposed on Matrix File*



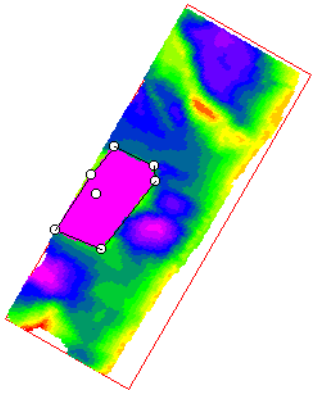
2. **Save your Border file** by selecting MATRIX-SAVE BORDER and providing a name. The file will be saved to your project directory with the *.BRD extension.
3. **Modify your data** by selecting MATRIX-EDIT BORDER. The Edit Matrix Region dialog will appear. For all soundings inside or outside the border (depending on where you right clicked when you created the border) you can:
   - **To delete them,** select 'Erase'.

FIGURE 3-60. *Deleting Soundings in SURVEY*



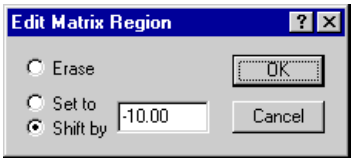
   - **To set them all to the same depth**, select 'Set To' and entering the depth you want.

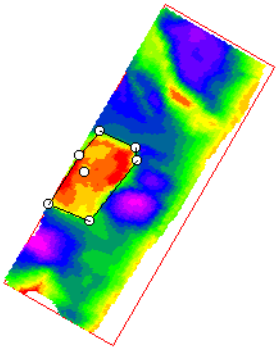
FIGURE 3-61. Setting Depths To One Depth



- **To increase or decrease all of the depth values by a constant number,** select 'Shift By' and entering the amount (positive or negative) by which you want to adjust your depths.

FIGURE 3-62. Shifting Depths by a Constant Amount



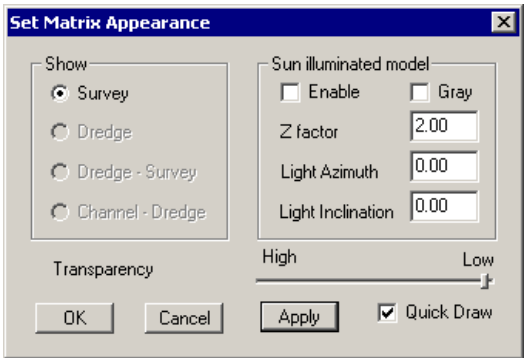


4. **Click [OK].** The dialog will disappear and the modification will be made and drawn to the screen.
5. **Remove the border file from your display (optional**) by selecting MATRIX-REMOVE BORDER.

MATRIX DISPLAY OPTIONS

The matrix files in each area map can be independently configured.

FIGURE 3-63. *Set Matrix Appearance Dialog*



The **Show** Options: In SURVEY, the only option is to display the survey depths. The remaining options are enabled only in DREDGEPACK®.

Matrix files have two depth fields, one for the pre-dredge survey depths and the other for dredge depths. This allows you to choose for the matrix to be color-coded according to any of the following values:

- **Survey** displays the 'as surveyed' depths
- **Dredge** displays the 'as dredged' depths
- **Show Dredge-Survey** displays the difference between the 'as surveyed' and 'as dredged' depths.
- **Channel-Dredge:** Shows the difference between the dredge depth and the channel template.

NOTE These settings *do not affect the values that are stored in the matrix*. They are for display purposes only. You can change them at any time.

Sun Illuminated Model Options: When you enable these options, the matrix will be displayed as a gray-scale solid TIN Model with a virtual light source that can be repositioned to accentuate the contours of your surface model.

- **Z-factor** multiplies the depth values to exaggerate or flatten the surface contours.
- **Light Azimuth** is the horizontal angle of the light source relative to the matrix.
- **Light Inclination** is the vertical angle of the light source relative to the matrix.

The **Transparency** option allows a user-defined transparency of the matrix in order to see displays, such as charts, that are drawn beneath it. The following figures show the matrix at varying levels of transparency.

FIGURE 3-64. *Transparency equal to 0*

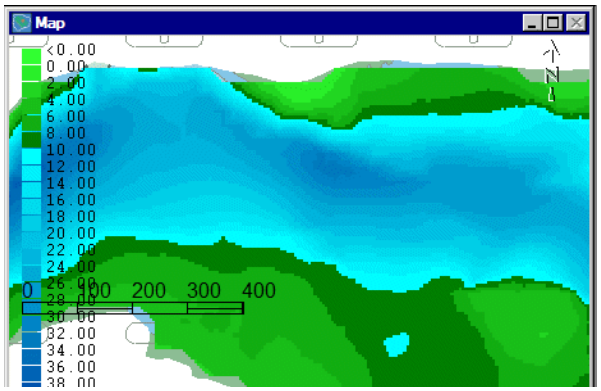


FIGURE 3-65. *Transparency equal to 1*

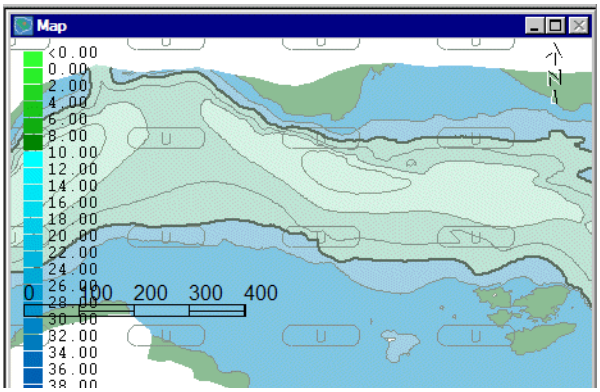
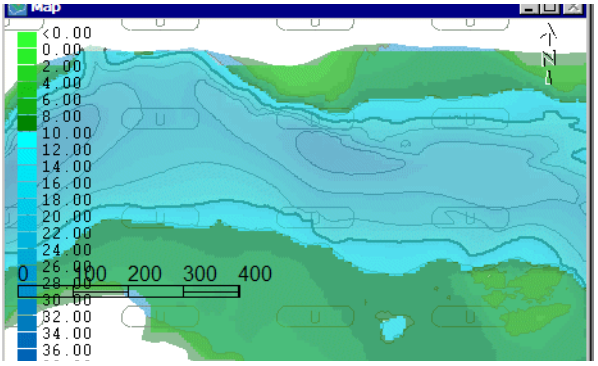
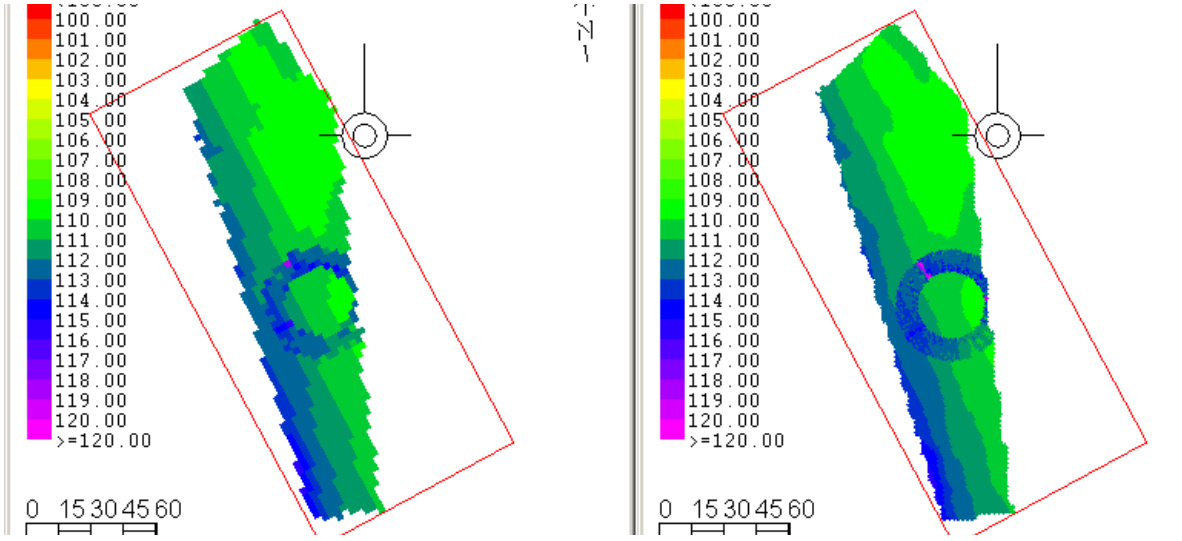


FIGURE 3-66. *0.4 (or 40%)*



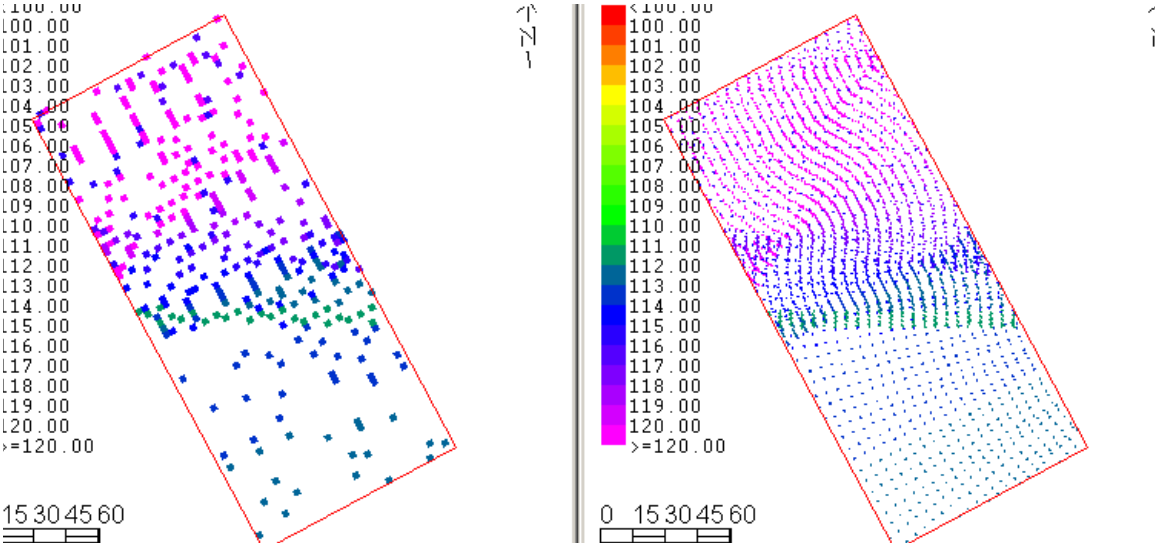
Quick Draw: It can use a lot of your CPU resources to draw and update filled matrix files in your Area Map display and, in some cases, this may interfere with recording your data. When you check this option, SURVEY uses a drawing routine that is less detailed at large zoom scales, but nearly undetectable when you zoom in. This frees your computer resources to log your data.

FIGURE 3-67. *Quick Draw (left) vs Regular Drawing (right)*



This option does not always provide a good representation of your data in matrix files that are sparsely populated.

FIGURE 3-68. *Quick Draw (left) vs Regular Drawing (right)*

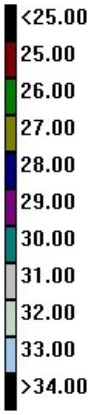


TIP: You can temporarily uncheck the Quick Draw option and click [Apply] to quickly view the more accurate display, then reapply the Quick Draw option as you continue logging data.

MATRIX COLOR SETTINGS

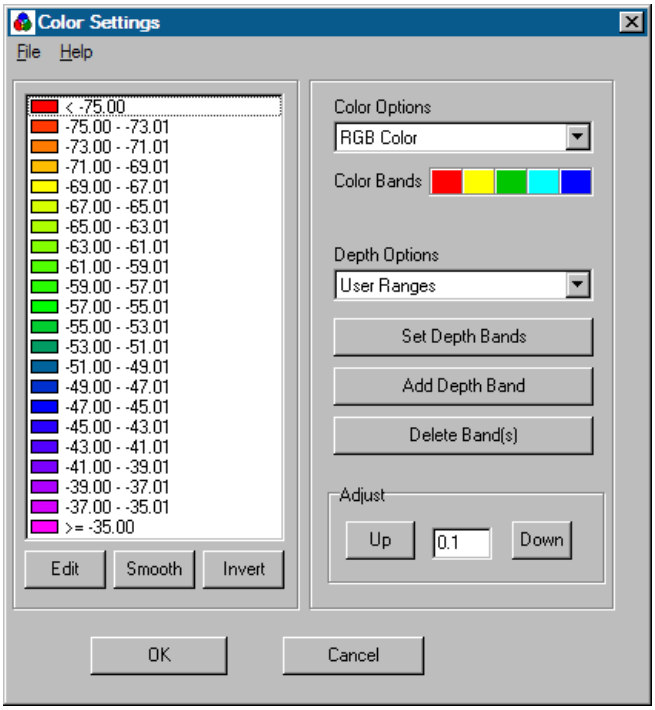
The matrix file colors default to the project colors set in HYPACK® Sounding Colors.
If a matrix is loaded in your area map, the matrix file legend will appear along the left-hand side of the Area Map. This displays the current color zones used to display the matrix depths.

FIGURE 3-69. *Sample Matrix Legend*



You can modify the colors through the Color Settings dialog by right clicking on the legend and selecting *Settings*. The Standard Color Settings dialog will appear for you to make any changes.

FIGURE 3-70. *Color Settings*



SAVING MATRIX FILES IN SURVEY

You can manually or automatically save your matrix data at any time as you work in your project.

Manual Saves

At any time, you can manually save your MTX or extract the data to an XYZ file based on the settings in your Matrix Options dialog.

- **To save your MTX** to its current file location and in its current state**,** select MATRIX-SAVE MATRIX.
- **To save the MTX data in XYZ format,** select MATRIX-SAVE TO XYZ to the current data in XYZ format. In this case, the data will be saved according to the choices in the Matrix Options dialog.

Automatic Saves.

After each user-defined time interval, the filled MTX file is saved to a binary record in the Archives folder. SURVEY names each binary backup using the original matrix file name appended with the time and an MTB extension (*FileName_HH_MM*.mtb). This provides you with a series of MTB files generated over the course of a day. The binary files are quite small; the improved security against data loss is well worth the storage space.

NOTE: The time for the first MTB is rounded to a time at or previous to the backup time and divisible by the time interval. For example, an MTB record generated at 10:23 will be named *FileName_10_20*.MTB. After that, the time extension will match the file generation time.

You can use any of these MTB files to restore your project MTX to its state at the time the file was generated. This provides an easy recovery from power failure.

To automatically generate binary backups of your matrix:

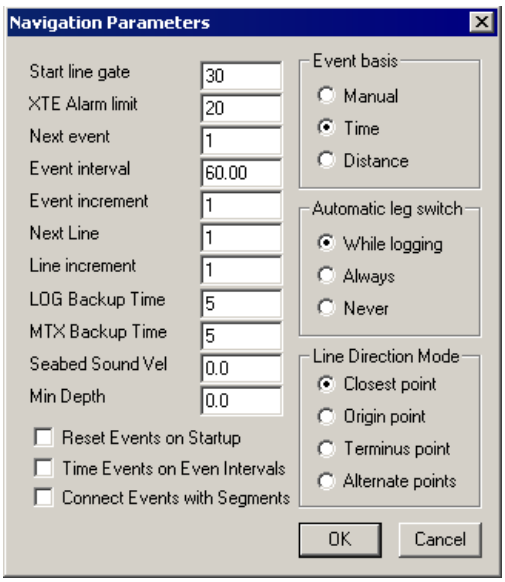
1. **Select OPTIONS–NAVIGATION PARAMETERS** and the Navigation Parameters dialog will appear.
2. **Enter a number, in minutes, in MTX Backup Time.** This is the frequency that the program automatically saves the MTX file. (A value of '0'disables this option.)

A value of 10 to 15 is recommended.

To restore your MTX from an MTB file:

1. In the HYPACK® screen, **right-click on the Matrix Files folder in the Project File list and select 'Convert Mtb->Mtx'**. A File Select dialog will appear.
2. **Select the MTB file you want to restore to MTX and click [Open]**. A File Save dialog will open.
3. **Name your restored matrix (MTX) and click [Save].** The name defaults to the root name of the selected MTB file.

FIGURE 3-71. *Navigation Parameters Window*



CORRECTIONS IN SURVEY

TIDE CORRECTIONS IN SURVEY

In HYPACK®:

Final Depth	=	Measured Depth	+	Tide Correction	+	Draft Correction	+	Sound Velocity Correction

Since the tide correction is normally added to the measured depth, it will normally be a negative value in HYPACK® (unless the tide drops below the chart datum).

For example, if the water level is 1.3m above the chart datum, the tide correction in HYPACK® would be “-1.3”.

To assign tide corrections to your sounding data:

- Use a telemetry tide system
- Manually enter tide corrections in the SURVEY program
- Use the Real Time Kinematic (RTK) Tide options in the GPS device driver.
- Read predicted tides into SURVEY using the Tidefile driver.
- Enter the tide correction values in post-processing

Configure you Data Display window to show tide data:

You can display one or more of the following tide data in the Data Display:

- Current tide correction

- Measured depth from the echosounder
- "Corrected" depth

Since the tide correction is applied to all vessels, it is displayed in Black in the Data Display window.

More Information

- "Tide Corrections in the Single Beam Editor" on page 4-13
- "Tide Corrections in the HYSWEEP® EDITOR" on page 6-8
- "Tide (Water Level) Corrections" on page 8-1

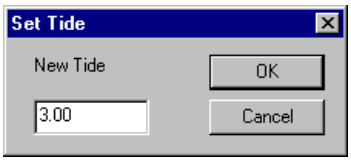
Telemetry Tide Gauges in Survey

The SURVEY program treats telemetry tide gauges like another piece of survey equipment. A device driver in the hardware configuration receives data from the device. Every time it receives an update from the telemetry tide gauge, it sets the tide correction to the appropriate value.

Manual Entry of Tide Corrections in Survey

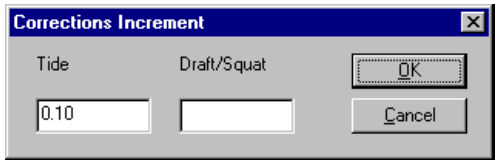
You can set the initial value of the tide correction by clicking the TIDE–SET menu item. This value will be assigned to all soundings logged until you set a new value. Update this value often, especially if the tide level is changing quickly.

FIGURE 3-72. *Setting the Tide Value*



The Tide Increase (Alt-Y) and Tide Decrease (Alt-Z) can be used to increase or decrease the current tide value by the current increment. The increment is set from the OPTIONS–CORRECTIONS INCREMENT menu item.

FIGURE 3-73. *Setting the Corrections Increments*



NOTE: If you use the same time and tide correction information to create a tide correction file, then use it to apply your corrections during post-processing, your results will be more realistic. The editor will interpolate the tide correction values over time, thus avoiding the sudden changes in tide correction values.

The tide correction value at the time each raw file is opened will be recorded in the header of the file. Each time you modify the correction value, it will be recorded as a TID record and used to correct soundings taken after that time.

Predicted Tide Corrections in Survey

You may assign predicted tide values to your raw data.

1. **Create a predicted tide file for your area** using either the MANUAL TIDE program's High/Low Water routine or the HARMONIC PREDICTION program.
2. **Create a device using the TIDEFILE.DLL device driver** when you configure your hardware. Under "Setup", select the name of your predicted tide file (*.TID).

The SURVEY program will then assign a tide correction to each sounding, based on the values in the prediction file. These values can be overwritten with actual tides when processing the data in the SINGLE BEAM EDITOR or HYSWEEP® EDITOR.

More Information

- "Manual Tides Programs" on page 8-5
- "Harmonic Tidal Predictions" on page 8-2

RTK GPS Tide Corrections in Survey

Real Time Kinematic (RTK) GPS receivers can measure the latitude, longitude and height above the WGS-84 reference ellipsoid to within a few centimeters. Using this vertical accuracy, you can determine water level corrections (tide corrections). This eliminates the need to use comventional tide gauges or to assign personnel to monitor tide staffs.

More Information

- "Real Time Kinematic (RTK) Tide Corrections" on page 8-14

Draft Corrections in SURVEY

In HYPACK®, Final Depth = Raw Depth + Static Draft + Dynamic Draft (+ Tide, SV and Heave corrections)

To log accurate depths, you must correct for both static and dynamic draft.

Static draft is typically incorporated into the echosounder during calibration so the sounder outputs depths corrected for static draft. Alternatively, you can enter the static draft as a vertical offset in your hardware configuration.

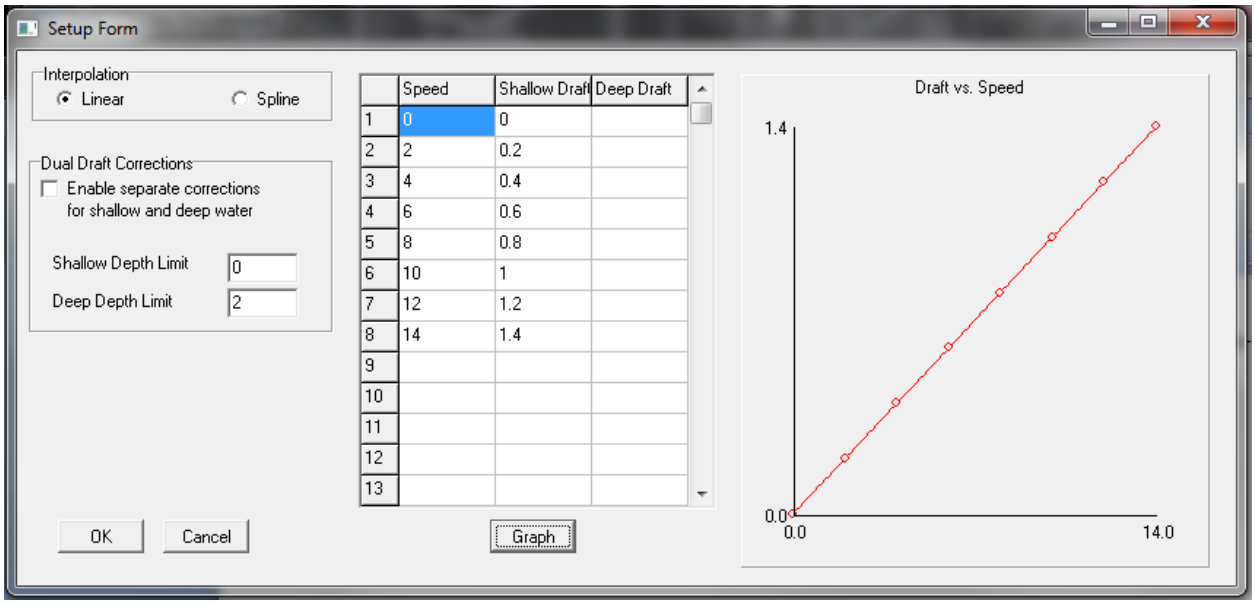
Dynamic draft corrections are logged with the rest of your data using your choice of the following options:

- **Manual Corrections:** Use the Draft option in the Vessel Setup dialog to adjust the correction currently logged in the data file. This value is logged in the header of each data file and to a DFT record each time it is changed.
- **Use the DraftTable Driver:** The DRAFTTABLE.DLL allows you to construct a table of Dynamic Draft Correction versus Speed. The

driver then uses the Speed Over Ground from the GPS (or the internal speed computed by SURVEY) and interpolates a draft correction based on the Speed Over Ground.

NOTE On a river, your speed through the water column may not equal your speed over ground. This could cause some significant errors in the Dynamic Draft correction being assigned by the driver.

FIGURE 3-74. *Configuring the DraftTable Driverr*



NOTE: If you are using RTK tides with HYPACK® you do not need to enter any dynamic draft corrections. The GPS.dll subtracts the dynamic draft correction to compute the "true" tide correction. Without a dynamic draft correction, the driver will still calculate a correct chart sounding, but the RTK Tide value will be different from the conventional tide value.

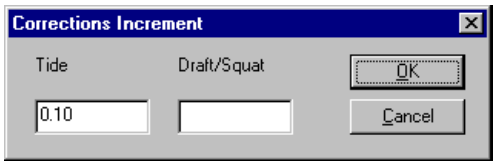
MANUAL DRAFT CORRECTIONS

Define Draft corrections for each vessel in the Vessel Setup dialog under "Draft".

Draft corrections are logged in the header of every data file and to a DFT record every time it is changed. This value is also displayed for each vessel in the Data Display using the Vessel Perimeter Color associated with each vessel.

To set the amount that SURVEY increments/decrements the Draft/Squat value select OPTIONS–CORRECTION INCREMENT and enter it under "Draft/Squat".

FIGURE 3-75. Setting the Corrections Increments



More Information

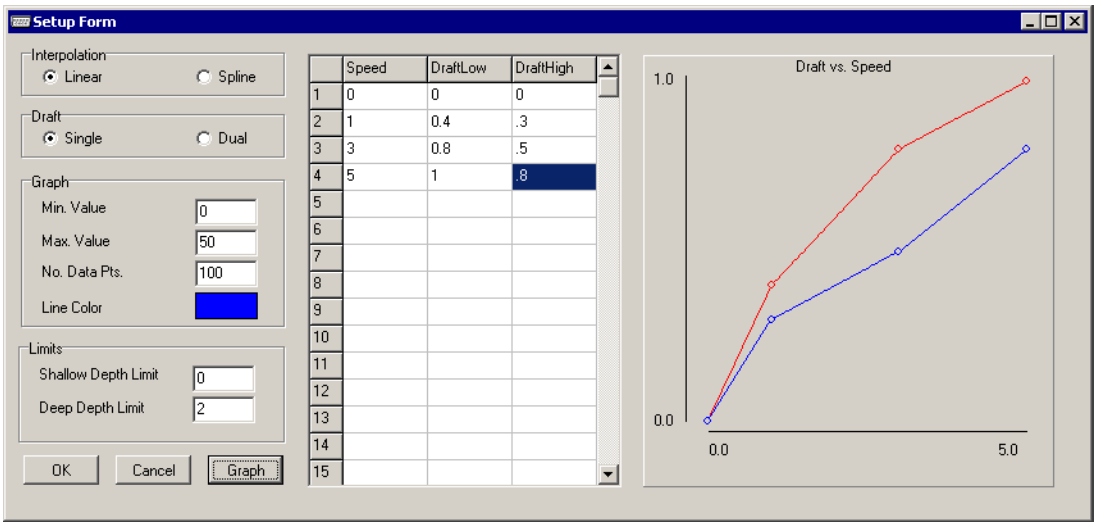
- "Boat Features in HYPACK® SURVEY" on page 3-33

AUTOMATIC DRAFT CORRECTIONS

Automatically apply draft/squat corrections by installing the Draft Table Driver in HARDWARE. The Draft Table is a listing of draft correction values with their corresponding vessel speeds. This option enables SURVEY to automatically apply dynamic draft/squat corrections based on the speed of the vessel.

1. **In HARDWARE, select DEVICES-ADD DEVICE** and select the DraftTable driver.

FIGURE 3-76. DraftTable Driver Setupl



2. **Click [Setup] and configure your driver for your project**. The Driver Setup is a table defining draft values and their corresponding vessel speeds. SURVEY interpolates draft values according to the selected interpolation method and within the defined speed range and stores a draft correction value appropriate to the vessel speed with each sounding.

   The driver allows for Shallow Water and Deep Water curves. Shallow depths can affect how the wake forms around the vessel and it has been shown it can significantly affect the draft. If this is the case, enter different drafts for shallow and deep water.

   If you enter both shallow water and deep water draft values:

- **When the depth is less than the Shallow Depth Limit**, use just the shallow water table.
- **When the depth is greater than the Deep Depth Limit**, use just the deep water table.
- **When the depth is between the Shallow and Deep Depth Limits**, interpolate between the two table values.

NOTE: If there are soundings taken at speeds greater than those defined in the Draft Table, the driver will assign draft correction value that corresponds to the fastest speed in the draft table

[Graph] plots your corrections over speed on the right.

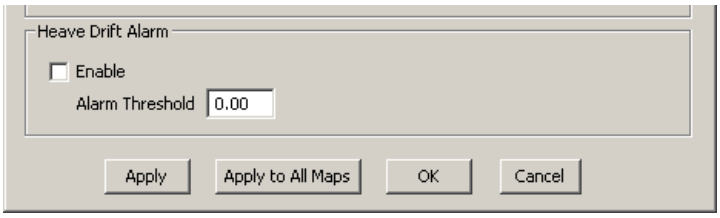
3. **Click [OK].**

HEAVE DRIFT CORRECTION

In the Vessels dialog, you can set an alarm for heave drift.

1. **Access the Vessels dialog** by clicking the Vessels menu.
2. **Check the Heave Drift Alarm Enable option and set the Alarm Threshold--**the amount of drift that should trigger the alarm.
3. **Click [OK].**

FIGURE 3-77. *Setting the Heave Drift Alarm*



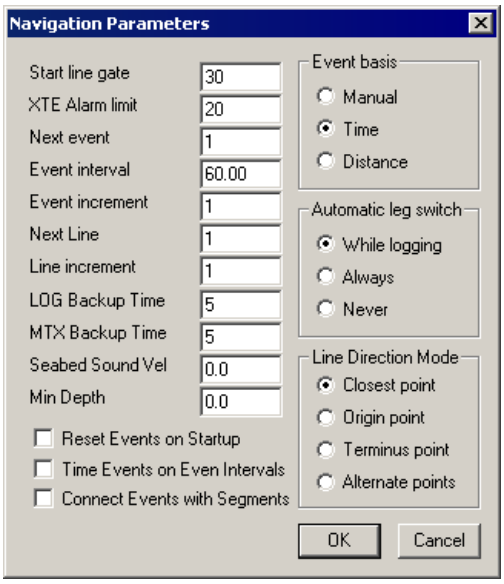
SURVEY averages the heave over a couple of wave periods. If the center of the heave average gets above or below the specified range, an alarm is generated in SURVEY.

NOTE: Do not leave the Alarm Threshold set to 0.00 with the Drift Alarm enabled. This will cause an annoying, constant alarm status.

NAVIGATING PLANNED LINES IN SURVEY

The Navigation Parameters dialog in SURVEY provides options to help automate the line navigation and data logging. This allows the helmsman to focus on driving while SURVEY handles the survey data.

FIGURE 3-78. Navigation Parameters Dialog



More Information

- "Selecting Survey Lines" on page 3-69
- "Changing Survey Direction" on page 3-70
- "Selecting Segments on Multiple Segment Lines" on page 3-71

SELECTING SURVEY LINES

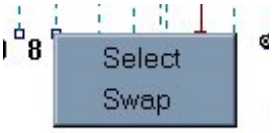
The active planned line in your project will be loaded to the SURVEY program. You can load a different line file by selecting LINE-SELECT FILE and choosing the new line file from the file selection dialog. SURVEY will unload any active line file and load the selected file. Only one planned line file may be enabled at a time. (You can unload any active line file and work with no lines loaded by selecting LINE-UNLOAD.)

When you first enter the SURVEY program, it will select the first line in the queue as the current active line. When you exit the SURVEY program, it writes the current active line to a default file. When you re-start the SURVEY program, it reads this default file and re-establishes the last active line as the current active line.

You can **select the line** you wish to survey using one of the following methods.

- **Right-click on a line handle and then click the "Select" item**. The "handles" are located at each line origin (the first point entered when creating the line) and are drawn as little boxes at the origin of a planned line.

FIGURE 3-79. Selecting a line using "Handles"



- **Use the LINE–INCREMENT LINE menu item** or Ctrl-I to move ahead by the number of lines defined under Line Increment in the Navigation Parameters.
- **Use the LINE–DECREMENT LINE menu item** or Ctrl-D to move back by the number of lines defined under Line Increment in the Navigation Parameters.
- **Enter the desired line number under Next Line in the Navigation Parameters**. You may enter either the number or name ("34+00") associated with a line.

CHANGING SURVEY DIRECTION

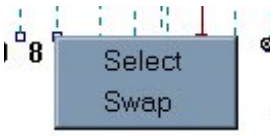
When you select a new planned line or when the SURVEY program selects a new planned line, it sets the "Start Line" end according to the Line Direction Mode in Navigation Parameters, and assumes you will be running the line from that end to the far end. It draws a red circle about the "Start Line" end (when off-line) to show you which end it has selected as the "Start Line" end. It also superimposes a series of arrows along the line to indicate the expected direction of travel.

- **Line Direction Mode** tells SURVEY the pattern the survey vessel will normally follow when a new planned line is selected.
  - **Closest** looks for the end of the line closest to the vessel and assumes you want to run the line starting from that end.
  - **Line Origin** starts the line at the first set of coordinates for the line in the Planned Line File. This is useful for surveyors who want to run all of their lines in the same direction.
  - **Line Terminus** starts the line at the last set of coordinates for the line in the Planned Line File. This is useful for surveyors who want to run all of their lines in the same direction.
  - **Alternate Direction** starts the next line in the opposite direction from the direction of current one based on the coordinates entered in the Planned Line File. (Alternates Origin-to-Terminus, then Terminus to Origin.)

To change the selection of the "Start Line" end:

- **Select LINE-SWAP.**
- **Right-click on the line handle and clicking "Swap".**

FIGURE 3-80. Swapping line direction using the 'handles'."



- **Select the line and press Ctrl + W.**

SELECTING SEGMENTS ON MULTIPLE SEGMENT LINES

This is used by SURVEY to determine how to step through multiple segment planned lines.

Select OPTIONS–NAVIGATION PARAMETERS. The available choices are:

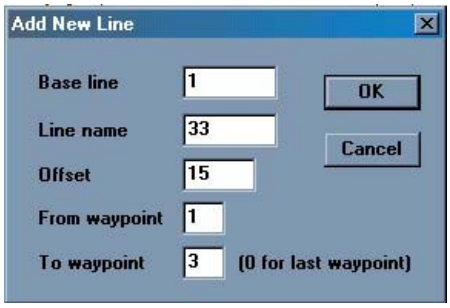
- **While Logging**: Using this method, the current segment is fixed until the program goes "On Line". It then automatically switches to the closest segment, based on the off-line distance of each segment.
- **Always:** This method constantly updates to the most appropriate segment, whether the program is "On Line" or "Off Line".
- **Never:** This will not change the current segment. You may manually change segments using the Ctrl-F (Forward Segment) or Ctrl-B (Backward Segment) key commands.

ADDING NEW LINES IN SURVEY

Surveyors can create a new planned line in SURVEY by specifying a parallel offset from an existing planned line.

Select LINE-ADD and the Add New Line dialog will appear. This example, tells SURVEY to create a new line named "33". This line will be created 15' (or meters, according to the current grid units) from line number "1". Positive offset values create lines to the right of the "Base Line" when you stand at point 1 of the base line and look at point 2. The new line created is saved to the LNW file and becomes a permanent line in the planned line file.

FIGURE 3-81. Add New Line Window



LOGGING DATA IN SURVEY

Typically, when you set up a survey project, you create a set of planned survey lines to guide your navigation as you collect data. They help insure that you achieve the proper coverage of your survey area. Most surveyors begin on the first line of the line file and navigate up one line and down the next, logging data for each line, until they reach the end.

When you begin logging data at the beginning of each planned line (start line), the SURVEY program opens up a data file and begins to record data. The status in the Data Display window will change to 'Logging'. This is your indication that you have started line and the SURVEY program is logging data.

You can start line manually or automatically.

- **Manually** by selecting LOGGING-START LOGGING (Ctrl+S)
- **Automatically** using the automatic Start Line Gate feature.

The automated Start Line Gate feature begins logging automatically if the vessel tracking point passes within the specified distance of the start line point.

The **Start Line Gate** is specified in the Navigation Parameters window. Select OPTIONS–NAVIGATION PARAMETERS.

- **If the Start Line Gate is set to "0.0",** the feature is disabled and the SURVEY program will only "Start Line" and "End Line" if you manually intervene.
- **If the Start Line Gate is set to a value other than zero**, the program will start line automatically when the distance from the tracking point to the starting point of the planned line is less than the absolute value of the Start Line Gate.
- **If a negative value is specified for the Start Line Gate**, the SURVEY program will only go "On Line" when the tracking point breaks the perpendicular projection of the start line point and the distance from the tracking point to the starting point of the planned line is less than the absolute value of the Start Line Gate.

Once logging has been started, it can be ended (end line):

- **Manually** by selecting the LOGGING-END LOGGING (Ctrl+E).
- **Automatically** if you are using the Start Line Gate. The line will be ended automatically when the tracking point breaks the a line projected perpendicular from the end segment point of the planned line.

When the SURVEY program executes an "End Line", it closes and saves the data file and then selects the next line in the line queue. It determines the start line point based on the Line Mode in the Navigation Parameters dialog. A small red circle is drawn about the start line point and arrows indicate the direction of travel.

BEWARE! Logging data to a network location has not been done successfully. All data should be logged on the survey computer.

PROJECT INFORMATION IN SURVEY

The project header data, which is written to the header of the raw data files, is defined in the project information. The header data is optional, (for display purposes only) but a year from now you may be thankful that somebody took the time to fill out the available fields.

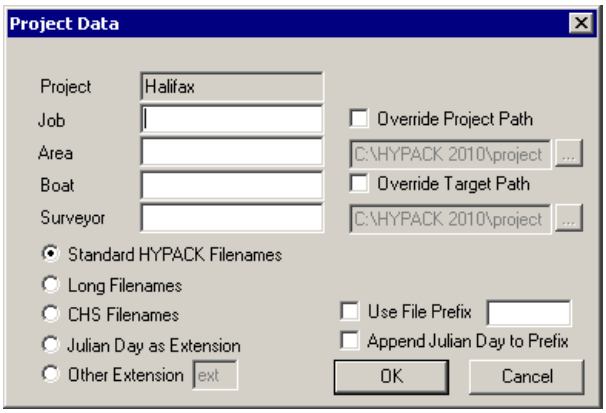
To enter your project information:

1. **Access the project information dialog** by selecting OPTIONS–PROJECT INFORMATION.
2. **Describe your project and click [OK]**.
   - The **Project, Job, Area, Boat** and **Surveyor** fields are selfe-explanatory.
   - **Choose your file-naming convention.**
   - **'Override Project Path':** Define alternate location to store your raw survey data. The default location is the *ProjectName*\Raw folder.
   - **'Override Target Path'** options enable you to define alternate locations to store your targets marked during SURVEY. The default location is the project folder.

Beware!

BEWARE! Logging data to a network location has not been done successfully. All data should be logged on the survey computer.

FIGURE 3-82. *Project Information Window*



More Information

- "Raw Data File Naming Convention".

RAW DATA FILE OPTIONS IN SURVEY

Raw files are the data files that result from the SURVEY or DREDGEPACK® program. Every time you go "On Line", a new "Raw" data file is created. They are ASCII format files that contain the header information and time-series information for each survey device.

By default, they have the extension "*.RAW" and, in a standard HYPACK® project, are stored in the \Hypack\Project\Raw directory. You may choose a naming format or an alternate directory (or both) in the SURVEY program under OPTIONS-PROGRAM INFORMATION.

A list of individual data files is provided in a Catalog (*.LOG) file. You can quickly draw or process a group of files by specifying the *.LOG name, instead of entering the name of each data file.

RAW format files are read through the SINGLE BEAM EDITOR where they are merged with Tide and other corrections and are written as Edited All format files

RAW DATA FILE NAMING CONVENTION

Each time SURVEY goes "on-line", a new data file is created with a unique name.

To set your file naming format, select OPTION-PROJECT INFORMATION and choose from the following options:

Naming Format	Description	Example
Standard HYPACK®	(See details below.)	
Named Lines	LineName.RAW	34P00.RAW

Naming Format	Description	Example
Unnamed Lines	LineNumber_start line time.RAW	014A1325.RAW
Long Filenames	YR+ 1ST 2 char. of boat + Julian day + time(HHMM)_Line Number	00BO0911325_014.RAW
CHS Filenames	YR + 1ST 2 char. of boat + Julian day + time(HHMM)	00BO0911325.RAW
Julian Day as Extension	HYPACK® name with Day Number as the extension	014A1325.091
Other Extension	You define the extension in the adjoining box.	014A1325.NEW
Use File Prefix	You define the prefix in the adjoining box.	JJB_014A1325.RAW
Append Julian Day to Prefix	Julian day is applied as a prefix.	153_014A1324.RAW

Standard HYPACK® Details:

- **If your lines have names**, your data file will be the name of the planned line, plus the extension. For example, if you are logging data on a line named "34+00", the resulting data file will be named "34P00.RAW". If you log on the same line again, it creates a data file named "34P00A.RAW". If you log on the same line once again, it creates a data file named "34P00B.RAW", etc.

  Line names of three or less numeric characters are an exception; they are named as if the lines do not have names.
- **If your lines do not have names**, your data file will be named using a combination of the start line time from the computer clock and the number associated with the line. For example, if you begin line #14 at 13:25, the survey information will be stored in a data file named "014_1325.RAW". If you start the same line again during the same minute, a data file named "014A1325.RAW" will be created.

You may also choose to append a prefix to any of these file name formats. Use the Julian Day, define your own prefix or use both options together.

It is impossible to duplicate or overwrite existing files in the SURVEY program.

More Information

- "Project Information in SURVEY".

Data Directories for Raw Data Files

When you create a new project, HYPACK® creates a sub-directory under the \HYPACK\Project directory with the name of your project. It then creates a sub-directory named 'Raw'. For example, if your new project was named "Richmond 1998", your raw data files from the SURVEY

program would be stored in the "\HYPACK\Projects\Richmond 1998\Raw" directory.

The SURVEY program stores your survey data, by default, in the HYPACK® "Raw" format in the \RAW directory under the current project.

To specify another directory path, select OPTIONS-PROJECT INFORMATION from the SURVEY menu and set a path under 'Override Project Path'.

Beware!

BEWARE! Logging data to a network location has not been done successfully. All data should be logged on the survey computer.

Closing Data Files Based on Time

If you anticipate being 'on line' for extended periods of time, you can instruct the SURVEY program to automatically close the current data file and open a new data file without changing the current survey line.

For example, say your planned line would take four hours to survey and you have entered "15" as the Log Backup Time. Every 15 minutes, SURVEY would close the current Raw data file and open a new data file. This would result in 16 data files for the planned line.

To set an automatic Log Backup Time:

Select OPTIONS–NAVIGATION PARAMETERS and enter a non-zero value in the "Log Backup Time". The value entered represents the number of minutes elapsed before closing the current data file and opening a new file. New files that are opened using this feature are named using the conventional naming scheme for data files which eliminates duplicate file names.

Logging Events in Survey

Event marks are also called "Fix Marks". They are used to mark recorders to allow you to correlate digital (HYPACK®) and analog records. Include the beep.dll in your hardware setup to sound a user-defined tone each time an event mark is created.

Automatic events

The **Next Event** item in the Navigation Parameters sets the number of the next event mark.

Reset Events on Startup causes your event numbers to begin at one, each time you launch SURVEY. If you clear this option, SURVEY "remembers" the last event number when it is shut down and, when restarted, will begin numbering event marks at the last number.

Event Marks are always generated when you pass a waypoint (switch legs) in your survey line.

Event Marks can also be automatically generated based on time or distance along line. Select OPTIONS–NAVIGATION PARAMETER and choose the **Event Basis**.

- **If you select "Time"**, the **Event Increment** is expressed in seconds.
- **If you select "Distance"**, the **Event Increment** is the distance in survey grid units (feet or meters) between events.

NOTE HYPACK® does not predict when your survey vessel passes over precise fix locations. It simply generates a fix mark at the first position update which is equal to or farther down-line from the pre-defined event location

To mark events on even intervals

Check '**Events on Even Intervals**'.

- **If your event basis is time**, automatic, mid-line events are generated at even second intervals. For example, if your event interval is 5 sec. and your start line event is at xxx12.072 sec., the next event will be at xxx15.000 (plus or minus .001 sec).
- **If your event basis is distance**, SURVEY attempts to place the events at even distance intervals based on DBL as you progress down the line.

To generate a manual event mark

At any time, select LOGGING-MANUAL EVENT (Ctrl+N).

To suspend logging

At any time while "On-Line", select LOGGING-SUSPEND LOGGING (Ctrl+U). The status in the Data Display window will display the word "Suspended". A target with the name "Paused" will be placed on the screen at the tracking point position. You will still receive screen updates and position information, but the program will not write information to disk. This is useful if the survey boat needs to pause for traffic.

To resume logging

Select LOGGING-RESUME LOGGING (Ctrl+R).

To draw a line between consecutive events

Check the '**Connect Events with Segments**' option. This is for display purposes in SURVEY only.

LOGGING SEABED IDENTIFICATION DATA IN SURVEY

The SeabedID device driver should be used for all bottom classification surveys. It requires that:

- **Your echosounder outputs the E1 and E2 soundings** necessary to distinguish between varying bottom types.
- **You have a Seabed Square for the bottom types in your survey area**. This is a user-defined table of E1-E2 ranges with their corresponding bottom types and ID numbers. It is created in the SEABED STATISTICS utility program.

- **You have saved your seabed colors represented in your Seabed Square as your project colors**. When you create your Seabed Square in SEABED STATISTICS, the program will ask if you would like to create a corresponding HYPACK® Color File (*.HCF) and make it the current project color file. Click "Yes".

During SURVEY, the SeabedID device driver refers to the Seabed Square to assign a Seabed ID number for each sounding record. It saves the E1-E2 pairs with their assigned numbers to ROX strings in the Raw data files.

The SeabedID driver has two device windows for each data channel. One shows your Seabed Square with a dynamic display of the most recent 500 soundings overlaid where they fell within the square. The other graphs depths over time.

FIGURE 3-83. *Seabed Square with overlaid Data*

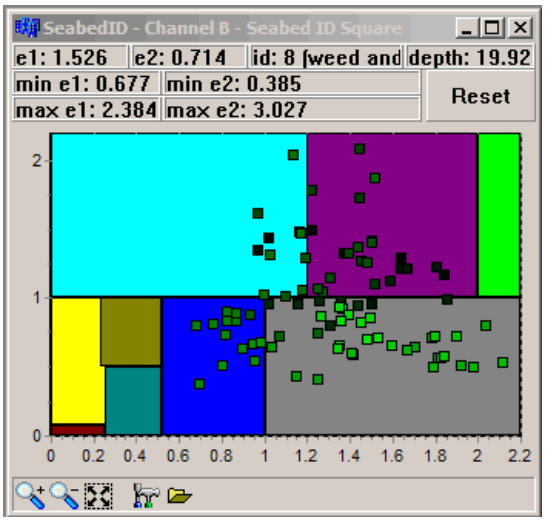
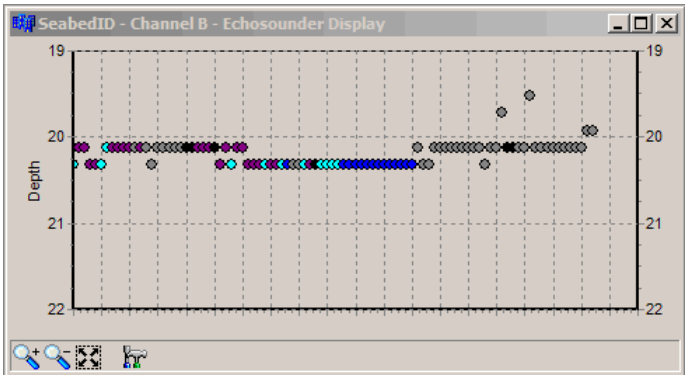


FIGURE 3-84. *Graph of Depths over Time*



Since the ID numbers are assigned in real-time, In addition to the device windows, SURVEY can paint the matrix using seabed classification colors. This requires certain settings working together.

1. **Create the Seabed Square** for your survey area.

2. **In the SeabedID driver setup:**
   - Select the 'Use for Matrix Update' option.
   - Designate your Seabed Square.
3. **In the SURVEY Navigation Parameters, enter the Seabed Sound Velocity.** This records the sound velocity corrections to the Raw data files. The sound velocity corrections are used by the SeabedID device driver.
4. **In the SURVEYMatrix menu, select the Seabed ID option**.

This matrix will also display in HYPACK® using seabed colors. Just right click on the matrix folder in the Project Files list and select either 'Survey Depth' or 'Seabed ID'.

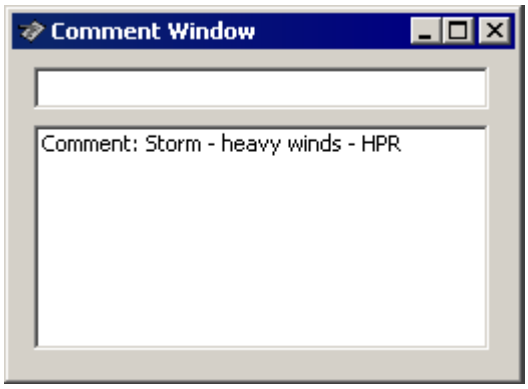
More Information

- "Seabed Statistics" on page 8-182

RECORDING COMMENTS IN SURVEY

The **Comment window** stores your input to the project log.

FIGURE 3-85. *Sample Comments Window*



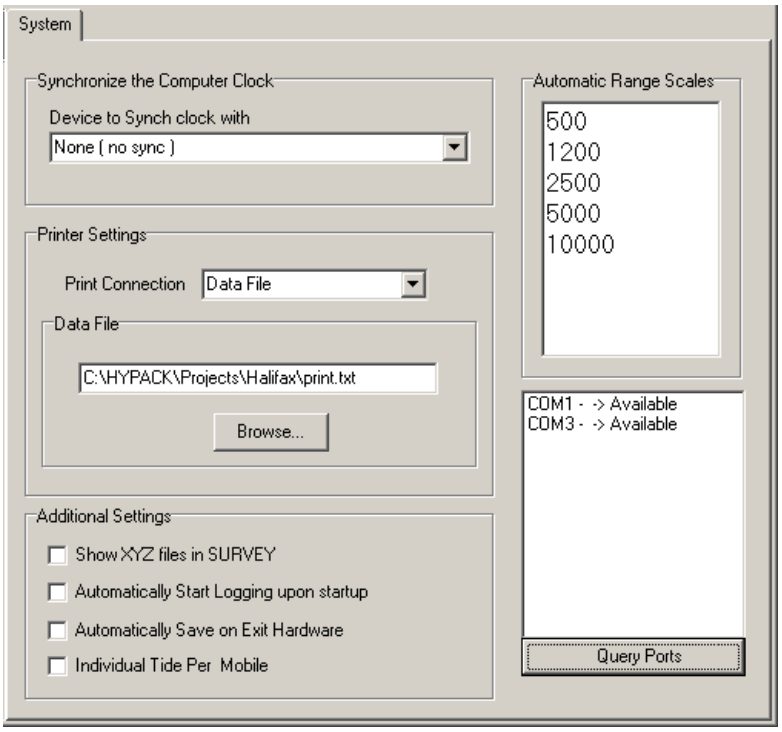
Enter your notes in the field at the top. Each time you press your Enter key, your comment drops down to the display in the lower part of the window and a copy is stored to the project log. In the SINGLE BEAM EDITOR and HYSWEEP® EDITOR, you can refer to these comments during the editing process.

PRINTING SURVEY DATA

You can print survey data while online to any printer. The location of the printer is specified under the Device menu of the HYPACK® HARDWARE program. The message to be printed is defined in the SURVEY program.

1. **Configure HYPACK® HARDWARE to perform this function**.
   a. **Click on PREPARATION -HYPACK HARDWARE**.
   b. **Select 'Hypack Configuration' and the System tabto the right.**

FIGURE 3-86. *Hypack System Tab*

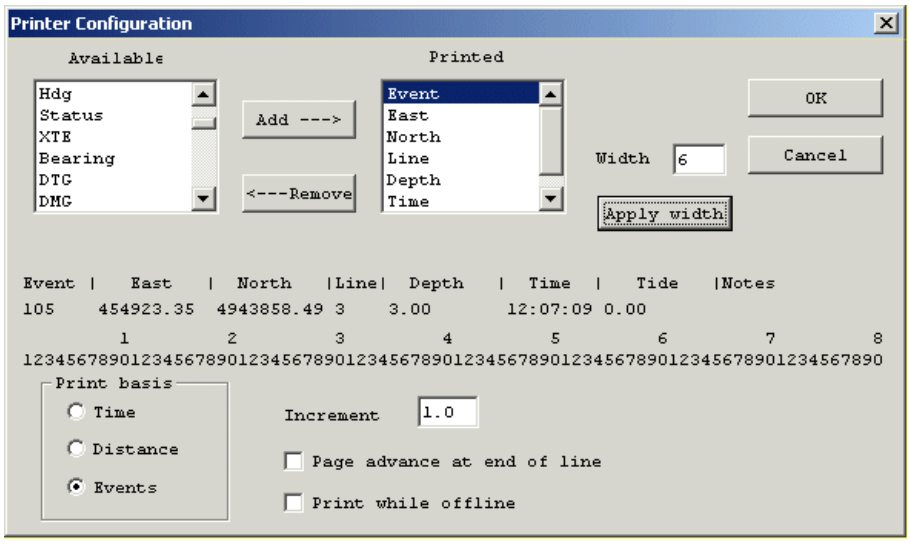


   c. **Set your Printer Connection to Data File**. This will send the information you want to a text file. The Data file configuration options will appear.
   d. **Click [Browse], navigate to where you want to save the file, enter a name**.
2. **Configure your output to the file**. SURVEY is where we configure exactly what we want to output to the file and at what frequency: Time, Distance, or Event.
   a. **Launch SURVEY.** Click the whale icon on the Icon Bar or select SURVEY-SURVEY from the menu.
   b. **Select LOGGING-PRINTER-CONFIGURE.** This will open the Printer Configuration window. The Printer Configuration window, will first appear with the "Printed" list blank.
   c. **Configure each item you want sent to your data file**.
      i. **Move items you want to have printed from the Available list to the Printed list in the order you want them printed.** You can move an item by clicking on an item in the Available list and then clicking [Add->] or by double clicking on the item in the Available list.

ii. **Enter the number of characters you want to reserve for each item in the Printed list**. Click on the item, then enter a value in the Width box. Click [Apply Width]. You can see the actual message constructed beneath the list windows.

NOTE Take care that your printer message does not exceed 80 characters.

FIGURE 3-87. *Printer configuration in SURVEY*



3. **Set other output options**.
   - **Print Basis** is the frequency, in seconds, at which the data is sent to the data file.
   - **Print while offline**: Check this option to print regardless of your logging status. Clear this option to print only while logging.
   - '**Page advance at end of line**': This option begins a new page at the start of each new planned line.
4. **Test your report generation in SURVEY.**
   - **If the 'Print while offline' option is selected**, SURVEY will automatically begin sending data to the text file as long as you are in SURVEY.
   - **If the 'Print while offline' option is *not* selected**, you must manually start the print function when you first open SURVEY. (Select LOGGING- PRINT- START.) After that, the printing will turn on and off with your logging status.
   - **Print Basis.** You can elect to have your message printed based on distance, time or events. In most operations, you should select "Events" with an increment of "1". This will print the requested data at each event mark.

To begin printing, select LOGGING–PRINT–START.

To shut down printing, select LOGGING–PRINT–STOP.

To print the header: At any time, you can print the header information by clicking the LOGGING–PRINT–HEADER menu item.

NOTE You may elect to print the information to a text file instead of sending the text to the printer. This can be done by specifying a "Data File" under the Connect information for the Printer in the HARDWARE program and then providing a name for the text file.

You can also print a full page-sized screen capture of your Area Map window by clicking the Print Screen icon in the tool bar.

SIDE SCAN SURVEY

SIDE SCAN SURVEY is a side scan data collection and logging program. The displays give real-time information on your survey area.

Digital or analog side scan data is logged to the HYPACK® HSX format. This data can then be imported by the SIDE SCAN MOSAIC program for viewing and targeting. HSX-formatted side scan data can also be used to create a mosaic. This mosaic may then be saved as a geo-referenced TIF file, which can be displayed in your project as a background file.

The playback mode replays the raw HSX files giving the same view seen on the selected survey vessel.

The HYPACK® SURVEY and SIDE SCAN SURVEY programs run simultaneously. HYPACK® SURVEY provides navigation and single beam data collection while SIDE SCAN SURVEY provides the side scan data. The logging status of SIDE SCAN SURVEY is controlled by SURVEY. Each time SURVEY begins or stops logging, it stores the logging status to shared memory. SIDE SCAN SURVEY monitors shared memory and matches its logging with SURVEY.

NOTE If you are collecting multibeam data with your side scan data, you may only need HYSWEEP® SURVEY program, instead of SIDE SCAN SURVEY, which supports side scan devices.

SIDE SCAN SURVEY provides a scrolling display of its data. You can create targets here in real-time or in the post-processing SIDE SCAN MOSAIC program. You can also capture a TIF file of areas of interest as you progress.

To launch SIDE SCAN SURVEY, select SIDE SCAN - SIDE SCAN SURVEY.

SIDE SCAN SURVEY WINDOWS

SIDE SCAN SURVEY includes a main window from which you can customize the tools and views of the program, and view alarm status and other information regarding your side scan survey.

Additional windows can be accessed to view your data in real time from different perspectives. Use the View menu in the main window to select those that you want to include in your display.

Most windows have a tool bar at the top, providing shortcuts to window configuration. Pass the mouse pointer over a tool to see a hint as to what the tool does. Tool bars are toggled on / off with the F10 key.

All of the windows can be resized and moved around the screen, retaining it's size and position until changed. VIEW-TILE WINDOWS will arrange the currently open windows in a manner that attempts to optimize your viewing in each window.

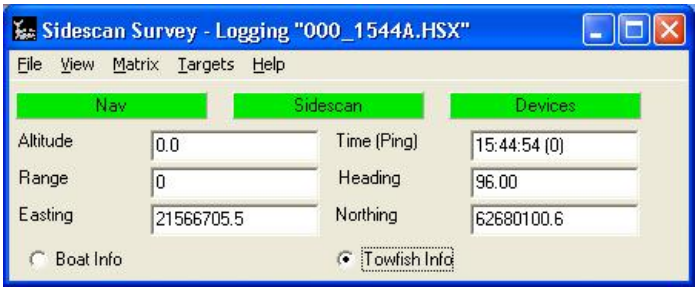
Main Window in Side Scan Survey

The main window consists of a menu, some indicators and some measurements. It can be resized to show only items of interest and will retain the size on subsequent program runs.

The title bar gives logging and playback status. "Offline" is shown when neither logging nor playback is active. The current data file is shown when logging or playback is active.

You can choose to display data relative to the boat or to the towfish by selecting the option at the bottom of the dialog.

FIGURE 3-1. *Side Scan Survey – Main Window*



Alarms in Side Scan Survey

SIDE SCAN SURVEY can be configured to continuously check for and notify you of data errors or loss of data input. They show green (OK), yellow (careful) or red (look out) depending on status. Click the indicator to show status history.

The **Nav** and **Sidescan** alarms turn red when no data has been received from the corresponding device for 10 seconds.

The **Devices** alarm turns red when no data has been received for a period longer than the Time Out Interval that you set for each device in the hardware setup.

Side Scan Survey Measurements

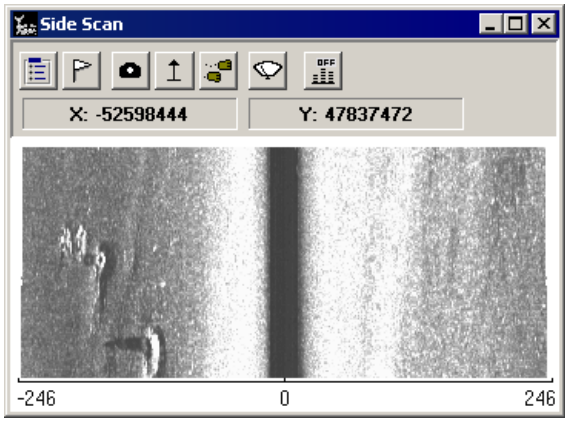
Updated about once a second. You can choose to display data relative to the boat or to the towfish by selecting the option at the bottom of the dialog.

- **Altitude:** Height of the fish from the bottom. If no digital altitude is available, SIDE SCAN SURVEY will use the bottom detect depth.
- **Time (Ping):** Latest sounding time and ping number. Time will not update if no soundings are being received.
- **Range:** The side scan range setting.
- **Heading:** Latest ship heading.

- **Easting / Northing or Lat/Lon:** Latest grid position from HYPACK® SURVEY. The default is Easting/Northing. Display lat/lon by checking the 'Display Positions in Lat/Lon' option in the View Options dialog.

SIDE SCAN WATERFALL WINDOW

FIGURE 3-2. *Side Scan Waterfall Window*



This is the traditional side scan display (forward looking and without slant range corrections) to which most hydrographers are accustomed. Reflection brightness and contrast are adjustable through the side scan controls and cursor position is shown in either X/Y or lat/lon in the status bar.

To access the Side Scan Waterfall window, select VIEW-SIDE SCAN WATERFALL from the main menu.

To display in lat/lon, check the 'Display Positions in Lat/Lon' option in the View Options dialog.

The normal speed of the Side Scan Waterfall is constant, but the speed of your vessel generally is not.

To adjust the speed to match the speed of the survey vessel, click the **Speed Compensation** icon. It displays objects and shapes in the scan in more realistic proportions (i.e. round objects look more round), but the display is not as smooth.

To access additional display settings, click the icon in the status bar.

A second Side Scan Waterfall window is available to support dual frequency units.

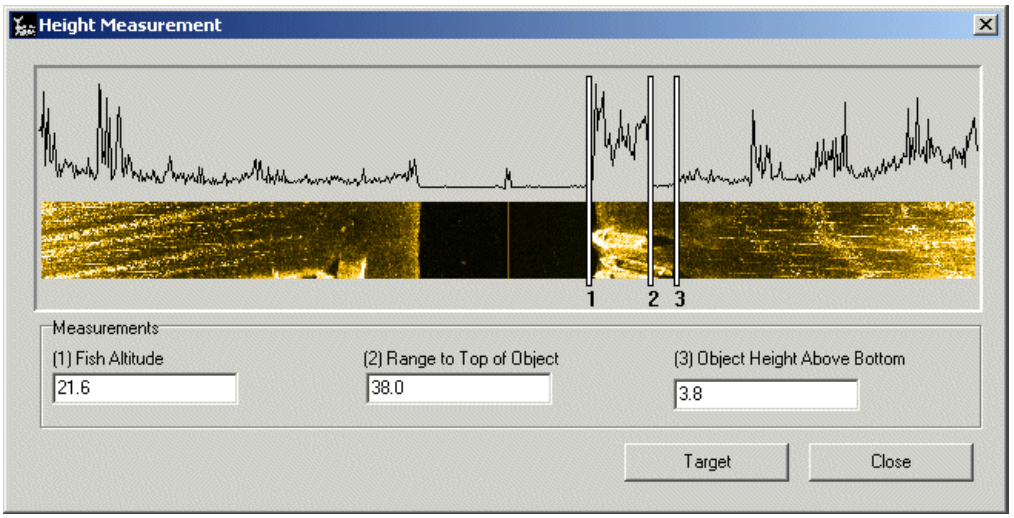
MEASURING OBJECT HEIGHT

The Height Measurement feature enables you to measure the towfish altitude, the range from the towfish to the object, and the height of the object above the bottom.

1. **Click the Height Measurement icon, then click on the object you want to measure**. The Height Measurement window will appear with a capture of the section of the scan containing the cursor

location, the corresponding Side Scan signal profile and three vertical markers.

FIGURE 3-3. *Height Measurement Window*



2. **Select and drag the three measuring rods into place** using the waterfall and signal capture as your guides:
   - The first rod to the bottom of the water column.
   - The second rod to the top of the object.
   - The third rod to the outer edge of the shadow.

   SIDE SCAN SURVEY calculates:
   - The height of the towfish above the bottom
   - The range from the towfish to the top of the object
   - The height of the object above the bottom

[Target] enables you to mark a target at the position of the object you are measuring. Click [Target] and the Target Properties dialog will appear with the coordinates corresponding to your click location.

Measuring Horizontal Distance

Click and drag your cursor across the distance to be measured. The status bar displays the distance and azimuth of the cursor's track.

Saving Side Scan Waterfall Screen Captures

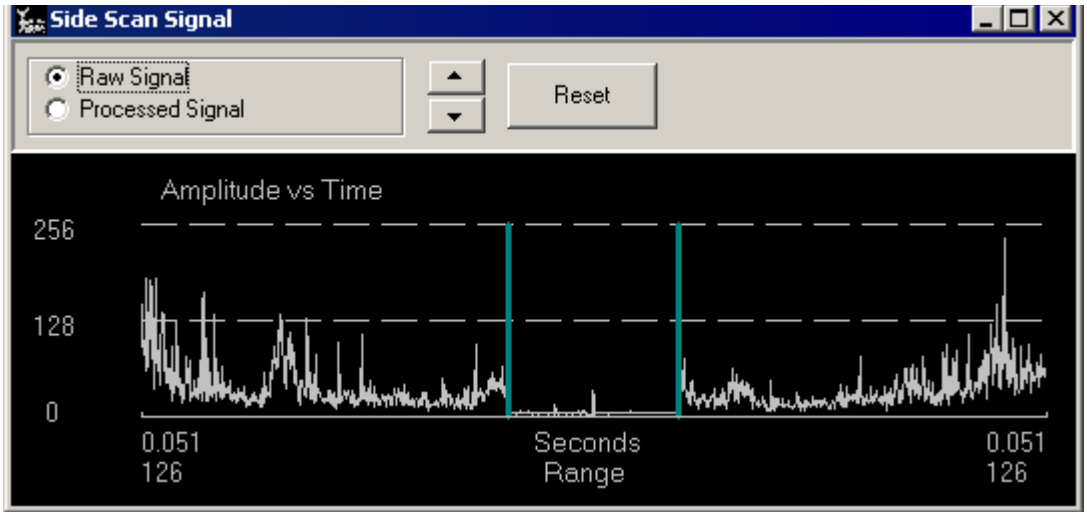
You can also save screen captures from the Side Scan Waterfall window. The TIF will not be exactly spatially correct, but it will be a clear representation of the area.

1. **Click the Capture Image icon, then click and drag the area that you wish to capture**. The described area will appear in a pop-up dialog for you to preview.
2. **Save the capture to *.TIF or *.JPG** format by clicking the File Save icon and naming your picture.

SIDE SCAN SIGNAL WINDOW

The signal window graphs amplitude vs. time for each sonar ping. Reflection amplitude is in units of A/D converter count.

FIGURE 3-4. *Side Scan Signal Window*



While this window has no particular value for bottom imaging, it is quite useful for verifying sonar operation. A second Side Scan Signal window is available to support dual frequency units.

You can choose to draw:

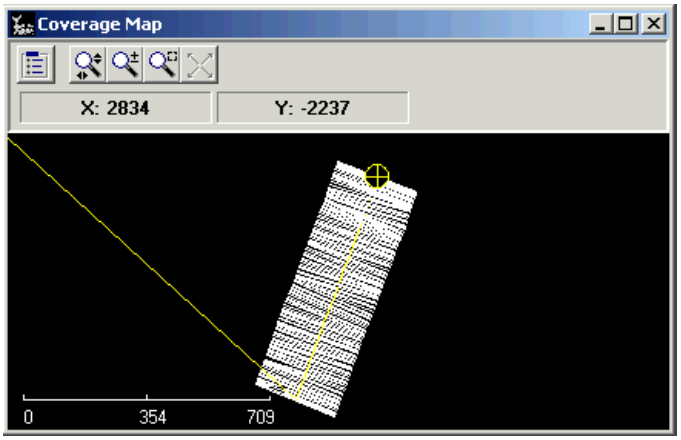
- **Raw Signal** as received directly from the sonar.
- **Processed Signal:** The Raw Signal with HYPACK® scaling and gains applied. The range can be adjusted using the arrow buttons.
- **Amplitude Range** can be adjusted using the arrow buttons.
- **Color Saturation** in the Side Scan Waterfall window can be adjusted using the horizontal sliders above and below the amplitude profile. Signal above the upper sliders will appear white in the waterfall window. Signal below the lower sliders will appear black. This method provides better results than using the side scan controls.

Access the Side Scan Signal window using VIEW-SIDE SCAN SIGNAL.

SIDE SCAN COVERAGE MAP

The Side Scan Coverage Map is an overhead view of your vessel and the area covered by your side scan sonar.

FIGURE 3-5. Side Scan Survey— Coverage Map



In this window you can:

- **Target contacts** by double-clicking the object of interest.
- **Monitor coverage** using a *Hysweep type* matrix file. To do this:
  a. **Enable a matrix file** in your project
  b. **Set the matrix to draw in SIDE SCAN SURVEY** through the matrix options dialog.

  NOTE: This means that you will not be saving depths to your matrix.

  c. **Select Show Matrix** in the View Options dialog.
- **Display grid position** by moving the cursor across the window. To display in lat/lon, check the 'Display Positions in Lat/Lon' option in the View Options dialog.

SIDE SCAN ALTITUDE WINDOW

Many of our users tow the side scan device on a towfish with an altitude sensor and it is handy, if not required, to know the towfish altitude during data collection. If your device outputs bottom tracking you can display the current towfish altitude in the Altitude window.

You may configure this window to display a red background if the altitude returned by the sensor falls below a user-defined limit.

To configure this window, select VIEW OPTIONS(F9). In the Altitude Tab, set the alarm limit to display a red background if the altitude returned by the sensor falls below this limit.

In the following example, the alarm limit was set to 36 survey units. At 37, the background is green but red at altitudes less than 36.

FIGURE 3-6. *Side Scan Altitude Window*

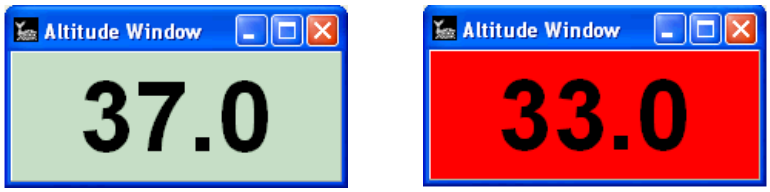
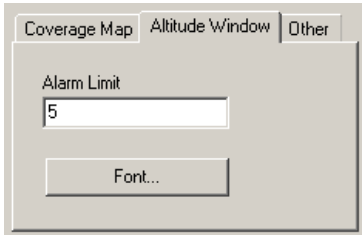


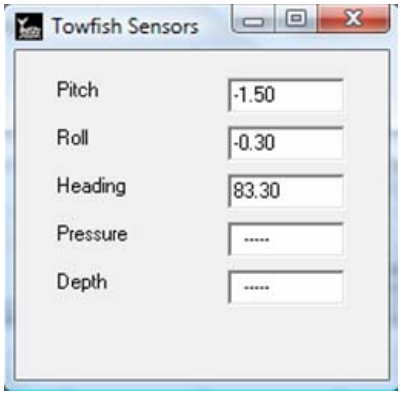
FIGURE 3-7. *Setting the Side Scan Altitude Window Alarm Limit*



TOWFISH SENSORS WINDOW

The Towfish Sensors window displays the pitch, roll, heading, pressure and depth of your side scan sonar.

FIGURE 3-8. *Towfish Sensors Window*



MESSAGE WINDOW IN SIDE SCAN SURVEY

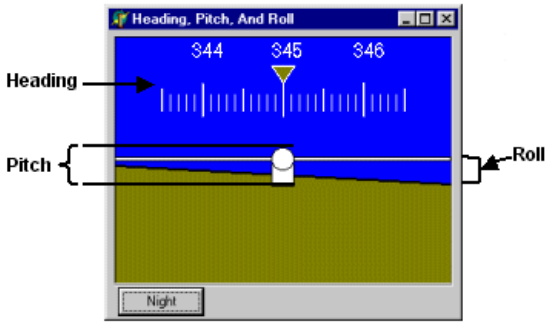
The Message window is a scrolling display of all messages read over an Ethernet device. You can pause the scrolling to study the content by clicking [Pause]. Click [Resume] to continue scrolling.

You may also record these messages to Message.txt, an ASCII text file stored in the HYPACK® install folder by checking the box.

GRAPHICAL MRU IN SIDE SCAN SURVEY

The Graphical MRU program shows Heading, Pitch and Roll in a real time, visual display.

FIGURE 3-9. *Graphical MRU Display*



The scale at the top of the window represents the heading.

The vessel is represented by the square in the center. When the vessel:

- **Is stationary**, the lines extending out on either side lie at the change from green to blue.
- **Rolls**, the diagram green/blue border rotates out of line with the horizon line by the amount of the roll.
- **Pitches**, the square moves vertically out of line with the circle by the amount of the pitch.

The Night button enables you to toggle between dark and light displays according to your survey environment.

This display reflects the motion of either the boat or the fish according to the vessel selected in the SIDE SCAN SURVEY shell.

VIEW OPTIONS IN SIDE SCAN SURVEY

The view options determine what data appears in the display windows and howthe windows should be configured to optimize the display.

- The **Device Selections dialog** is used to choose the source for each type of data displayed.

  To access the Device Selections dialog, select VIEW-DEVICE SELECTIONS.
- The settings in the **View Options** dialog determine how the data should be displayed. Each of the windows is configurable to a certain extent. Range settings are adapted to expected bottom depths, display styles are selected to the operators personal preference and need.

  To access View Options:
  - Select VIEW-OPTIONS from the shell menu.
  - Click the View Options icon in the toolbar where available
  - Press F9 for Coverage Map controls, and Shift + F9 for Waterfall controls.

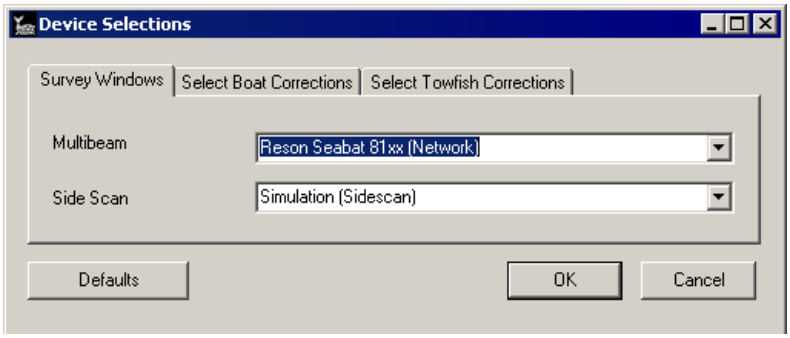
DEVICE SELECTIONS IN SIDE SCAN SURVEY

The Device Selections dialog is a three-tabbed dialog. Each drop-down listing is populated based on your hardware configuration.

[Default] sets each field to the first device of each description in your device list.

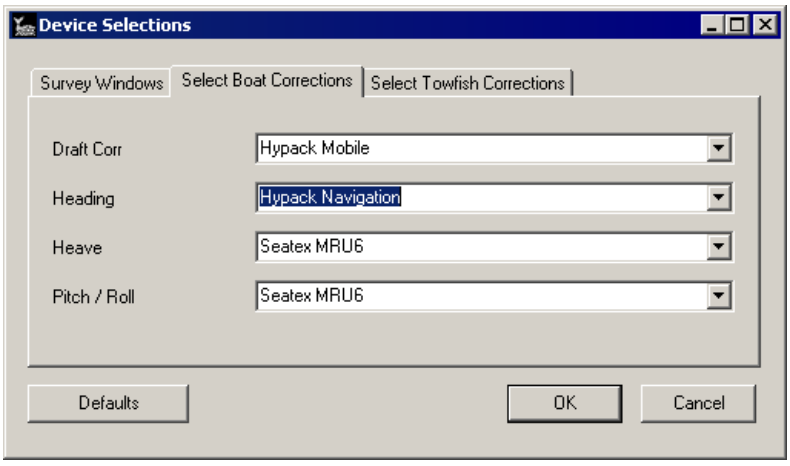
- In the **Survey Windows** tab, select the device from which your displayed data should be read.

FIGURE 3-10. *Device Selections Dialog - Survey Windows Tab*



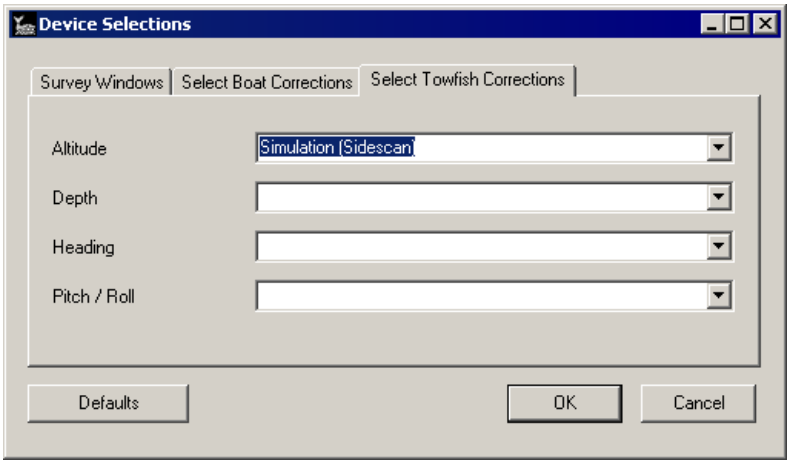
- In the **Boat Corrections** tab, select the device from which each value is read for the survey boat in your hardware configuration.

FIGURE 3-11. *Device Selections Dialog - Boat Corrections Tab*



- In the **Towfish Corrections** tab, select the device from which each value is read for the mobile in your hardware configuration.

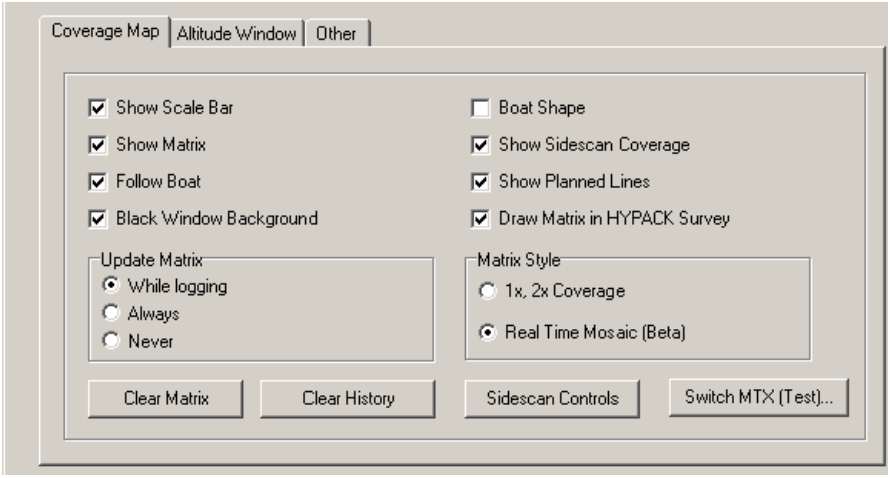
FIGURE 3-12. *Device Selections Dialog - Towfish Corrections Tab*



SIDE SCAN COVERAGE MAP VIEW OPTIONS

The Coverage Map View Options (F9) allow you to define which objects are displayed in your coverage map.

FIGURE 3-13. *Coverage Map View Options*



Show Scale Bar displays the distance scale bar.

Follow Boat re-centers map when the boat leaves the screen.

Black Window Background displays the data on black. The alternative is a white background with black display.

Boat Shape shows a generic boat shape vs the circle boat symbol.

Show Sidescan Coverage displays lines extending outward from the transducer to indicate the coverage area.

Show Planned Lines displays the survey lines.

[Clear History] removes side scan coverage lines that have drawn to that point.

Show Matrix displays the matrix enabled in your project in the Coverage Map.

The **Draw Matrix in HYPACK® SURVEY** option determines whether the matrix will be displayed in the HYPACK® SURVEY Area Map as well as in the SIDE SCAN SURVEY Coverage Map.

NOTE: You must also select the **Show Matrix** option.

Update Matrix options control when SIDE SCAN SURVEYpaints the matrix in the Coverage Map window *and when side scan data is passed to SURVEY*.

BEWARE! If you are painting the matrix in HYPACK® SURVEY, you must update the matrix in SIDE SCAN SURVEY *at least as often* as you update your matrix in HYPACK® SURVEY. If the matrix update setting is less frequent in SIDE SCAN SURVEY, it cannot supply the data required to accurately paint the matrix in HYPACK® SURVEY.

Matrix Style:

- **1x 2x Coverage** increments the matrix color according to the number of times the cell has been covered.
- **Real Time Mosaic** colors the matrix according to the return intensity.

TIP: If you select this option, set your colors to range from 0 to 255 and select one of the predefined side scan options in the Color Options list. This will mimic the Side Scan Waterfall display and the color combinations offered in the side scan controls.

[Clear Matrix] empties the matrix file.

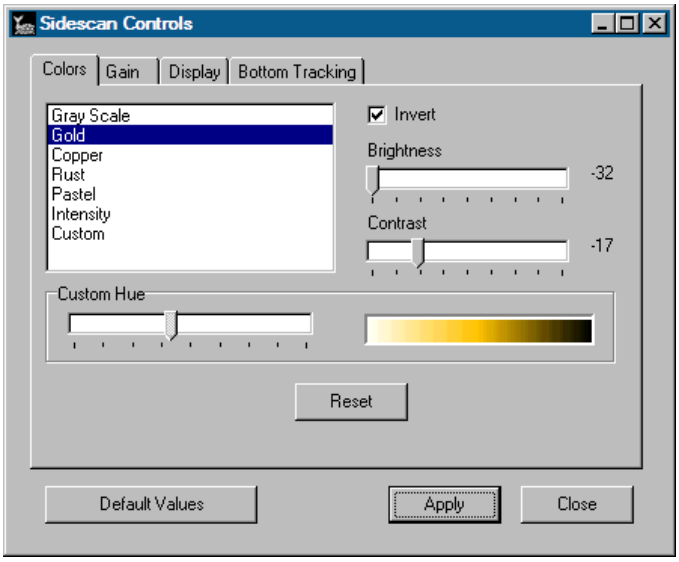
SIDE SCAN WATERFALL CONTROLS

The Side Scan Controls (Shift + F9) enable you to adjust the display settings for the Side Scan Waterfall window. Additional tools appear in the tool bar.

SIDE SCAN COLOR CONTROLS

The Color tab allows you to adjust all of the color properties of the scrolling data in the display

FIGURE 3-14. *Side Scan Controls Dialog—Colors Tab*



There are several preset color options for which you can adjust the brightness and contrast using the corresponding sliders. In each case, low amplitude is light and high amplitude is dark. This is the traditional method of displaying side scan. You can also reverse amplitudes that are represented by the dark and light color by checking the **Invert** checkbox. This is a more natural display because it emulates light and shadows.

You may also create a **custom color scale** by selecting Custom and moving the Custom Hue slider until your favorite color appears in the sample window of the dialog. The brightness and contrast can be adjusted on your custom color scale as well.

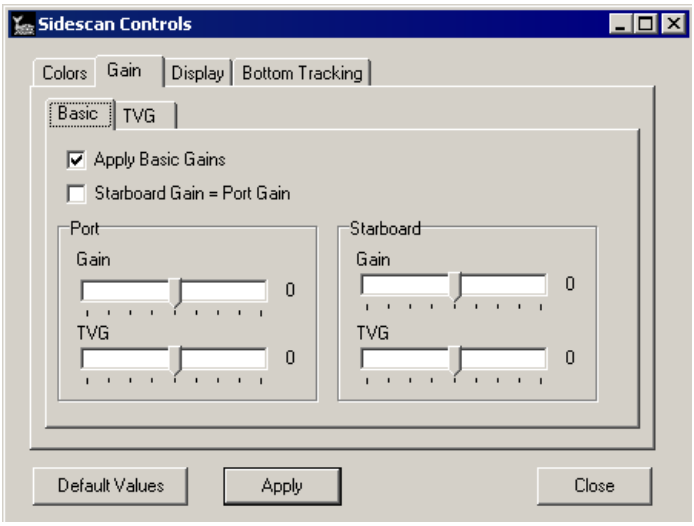
[Default] returns the setting to the Gold setting with 50% brightness and contrast.

[Reset] resets the average amplitude value. The color schemes are all based on this value so, if your display looks light or dark and the Brightness control doesn't help, try this button to correct it.

Side Scan Gain Controls

The basic gain controls are available separately for port and starboard transducers. Check 'Apply Basic Gains' and use the sliders to optimize your displays.

FIGURE 3-15. Side Scan Controls Dialog—Basic Gain Tab



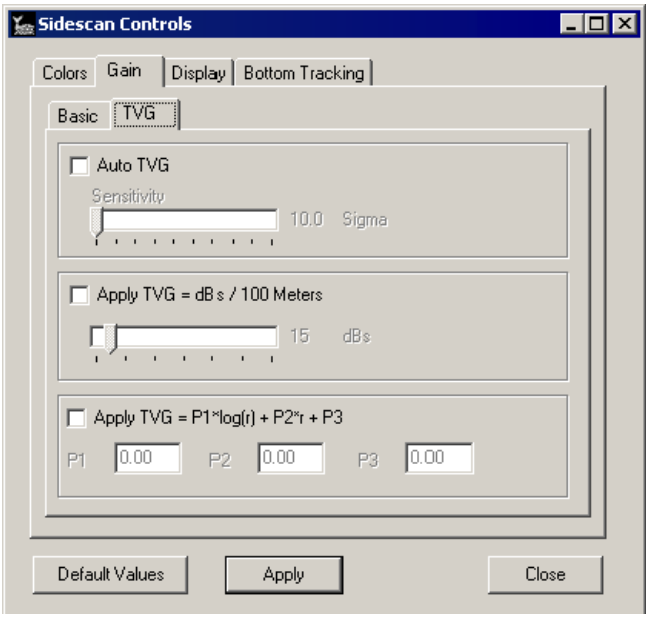
Gain adjusts the signal level uniformly up or down.

TVG compensates for signal loss due to absorption. It is a linear increase with time.

Starboard Gain =Port Gain keeps the two settings synchronized.

The TVG gain controls are custom controls for which we were contracted by some of our French users. Auto TVG scales colors based on the along track time series of each sample.

FIGURE 3-16. Side Scan Controls Dialog—TVG Gain Tab



Typically, the side scan image darkens as the distance from the sonar head increases. Since the decreased strength of return toward the outer areas is

due primarily to the distance from the sonar head, the program attempts to even the color over the distance scanned.

- **Auto TVG:** Attempts to automatically find present the best display.
- **Apply TVG = dBs/100Meters**: The strength of return will be multiplied by this value for every 100 meters of distance from the transducer it is.
- **Apply TVG equation:** This option enables you to apply a straight shift, a linear shift, an exponential shift or any combination of the three according to the values you enter for the P1, P2 and P3 variables. Each side scan device is different, so there are no default or suggested values. Experiment with different values to optimize your display.

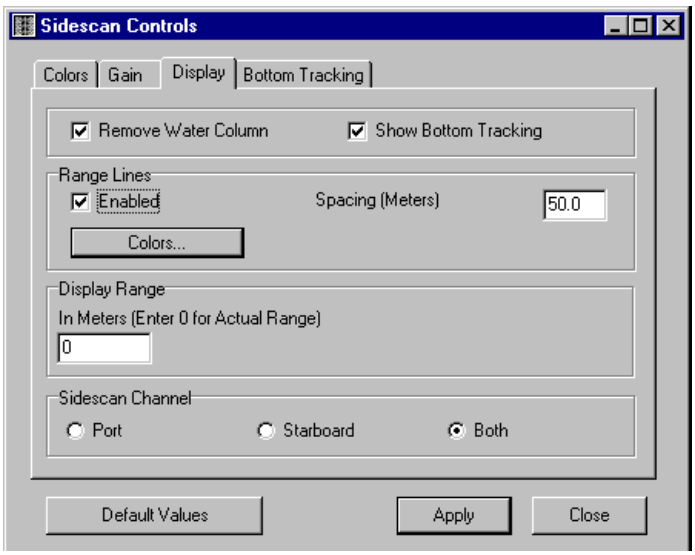
You can toggle between these TVG settings using the Toggle TVG icon on the window's tool bar. With each click it changes to the next method:

- **Click 1: Auto TVG.** The current sigma setting is displayed and the scroll buttons enable you to adjust the sigma setting 1 sigma for each click.
- **Click 2: dBs/100 meters.** The dB setting is displayed and the scroll buttons enable you to adjust the dB setting 5 dB for each click.
- **Click 3: Off**. (The TVG equation is only applied through the dialog.)

Side Scan Display Controls

The Display Tab contains options which determine the method to calculate the data to be displayed.

FIGURE 3-17. *Side Scan Controls Dialog—Display Tab*



Remove Water Column removes the portion of the side scan record before the sound reaches the bottom (the blank stripe in the middle) from the display. For this option to work well, your towfish altitude must be accurately measured.

Show Bottom Tracking superimposes a line that represents the bottom tracking in the Side Scan Waterfall window.

Default Fish Altitude is used when towfish altitude above the bottom is unknown. When altitude is provided by the sonar interface, the default is ignored. This option is disabled if the Remove Water Column option is not selected.

Range Lines draws lines at the user-defined Spacing Interval and color from the water column outward.

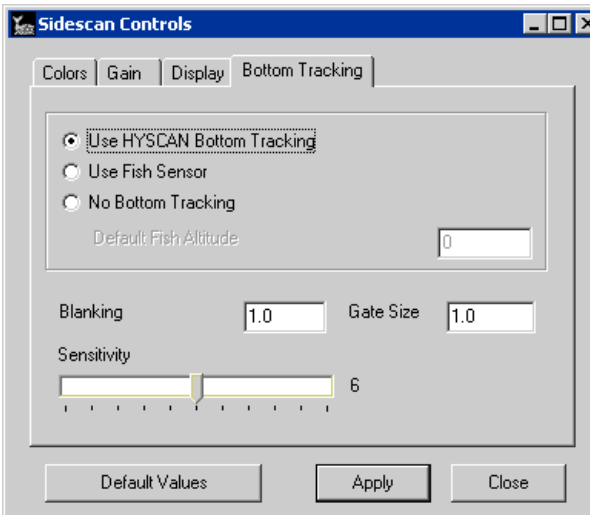
Display Range sets a constant width of the side scan to be displayed. Set this value to 0 and the window will autoscale according to the full extent of the data.

The **Channel options** enable you to view the Port or Starboard channel alone or both of them together.

BOTTOM TRACKING CONTROLS

The Bottom Tracking options draw a blue line in your side scan display at the position where SIDE SCAN SURVEY recognizes the bottom. This position is also recorded to your file and used as the assumed bottom by SIDE SCAN MOSAIC in post-processing, but you can override this setting at that time if you wish.

FIGURE 3-18. *Side Scan Controls Dialog—Bottom Tracking*



Choose the source from which you want to read the depth or select "No Bottom Tracking" and set a constant value that approximates the depth.

If you select the SIDE SCAN MOSAIC Bottom Tracking option, the options in the lower part of the dialog are enabled.

Blanking tracks the bottom that distance (in survey units) downward from where it reads the bottom.

- **0** is the same as no bottom tracking.
- **Low setting** eliminates the effects of backscatter to help find the true bottom.

- **Very high setting** can actually set the bottom tracking at a depth greater than the true depth.

Gate Size tells SIDE SCAN SURVEY to ignore soundings that are the depth plus or minus that amount several times before adjusting the bottom tracking. This helps to filter bad soundings from the bottom tracking records.

Sensitivity affects how receptive the tracking is to changes in the water column. A low value is less likely to adjust the bottom tracking for minor distortions in the water column, but more likely to miss real bottom changes. Conversely, a high value will adjust for everything, even things that it probably shouldn't.

Bottom Tracking: When your towfish does not carry an altitude sensor, you can still track the bottom using the HYSCAN Bottom Tracking.

In the side scan controls:

- Select 'Show Bottom Tracking'
- Clear 'Remove Water Column'
- Select 'Use HYSCAN Bottom Tracking'
- Set your Blanking, Gate Size and Sensitivity

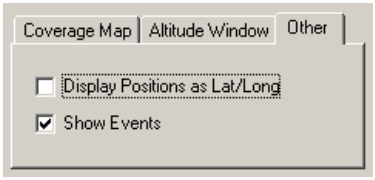
In the Side Scan window, click the 'Bottom Tracking' icon, then click on the waterfall display at the approximate level where you think the bottom should **be**. Side Scan Survey will then begin searching for the bottom at that level, and continue to search based on the other settings in the Bottom Tracking tab until it detects the actual bottom.

OTHER SIDE SCAN SURVEY VIEW OPTIONS

Display Positions as Lat/Long: All SIDE SCAN SURVEY windows that display position information can do so in projection grid coordinates (default) or in lat/lon.. To display position in lat/lon, check the 'Display Positions as Lat/Long' option in the View Options dialog.

Show Events: Draws event marks in the Side Scan Waterfall display.

FIGURE 3-19. *View Options – Other Tab*



The normal speed of the Side Scan Waterfall is constant, but the speed of your vessel generally is not.

To adjust the speed to match the speed of the survey vessel, click the **Speed Compensation** icon. It displays objects and shapes in the scan in more realistic proportions (i.e. round objects look more round), but the display is not as smooth.

LOGGING DATA IN SIDE SCAN SURVEY

Data logging may be controlled by HYPACK® SURVEY or SIDE SCAN SURVEY. Logging commands are passed between the two programs to keep them in the same mode. You may control logging in SIDE SCAN SURVEY using:

- Menu commands
- The same keyboard shortcuts as HYPACK® SURVEY.
- The DATA LOGGER and use the control buttons in that dialog, though there is no real benefit to this option.

NOTE: Data can not be logged for three seconds before and after midnight. During this time SIDE SCAN SURVEY will close the current data files and open new ones named according to the new date and time.

TABLE 3-1. *Logging Methods*

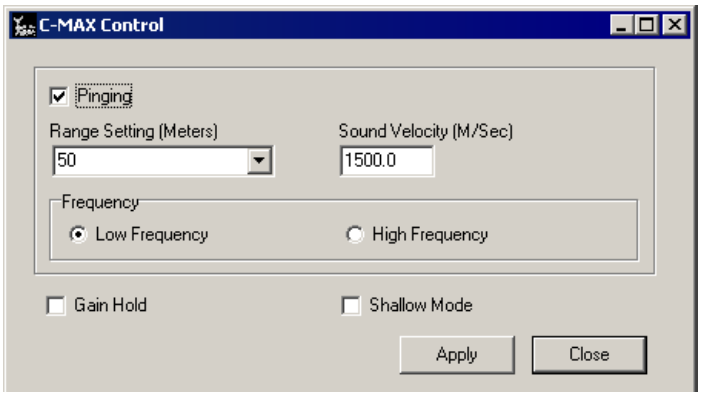
FILE-HYPACK® Commands	DATA LOGGER Buttons	Keyboard Shortcuts
START LOGGING	[Start Logging]	Ctrl + S
END LOGGING	[End Logging]	Ctrl + E
INCREMENT LINE	[Increment Line]	Ctrl + I
DECREMENT LINE	[Decrement Line]	Ctrl + D
SWAP LINE	[Swap Line]	Ctrl + W
MARK EVENT		Ctrl + N

SIDE SCAN DEVICE CONTROLS

Some side scan devices have settings and controls on the device. SIDE SCAN SURVEY allows you to control these options from your survey computer instead of using the device controls and without exitingthe survey programs.

Select TOOLS-SIDE SCAN DEVICE CONTROLS and a dialog specific for your side scan device will appear.

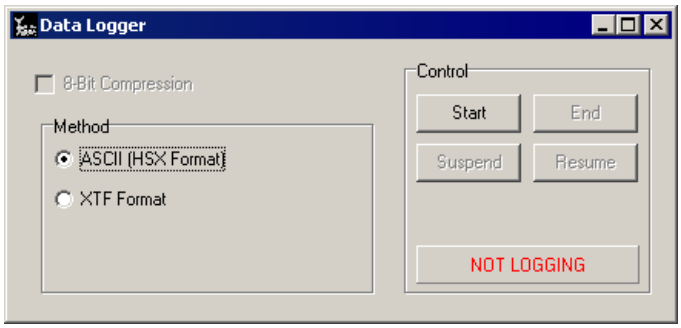
FIGURE 3-20. *Side Scan Device Control for C-Max CM2 Side Scan*



SIDE SCAN DATA LOGGER

Select FILE-DATA LOGGER (or press F7). Set your options for logging survey data to files before you begin logging.

FIGURE 3-21. *Logging Options Window*



- **Record Method:** SIDE SCAN SURVEY can save your data to HYPACK'S HSX format or to XTF format.

NOTE: HYSWEEP® SURVEY can not log side scan data to XTF format.

The **Control buttons** effect all data logging in all of the currently active Survey programs.

MATRIX FILES IN SIDE SCAN SURVEY

Matrix files are gridded rectangular areas. A matrix file enabled in your project is automatically loaded into SIDE SCAN SURVEY.

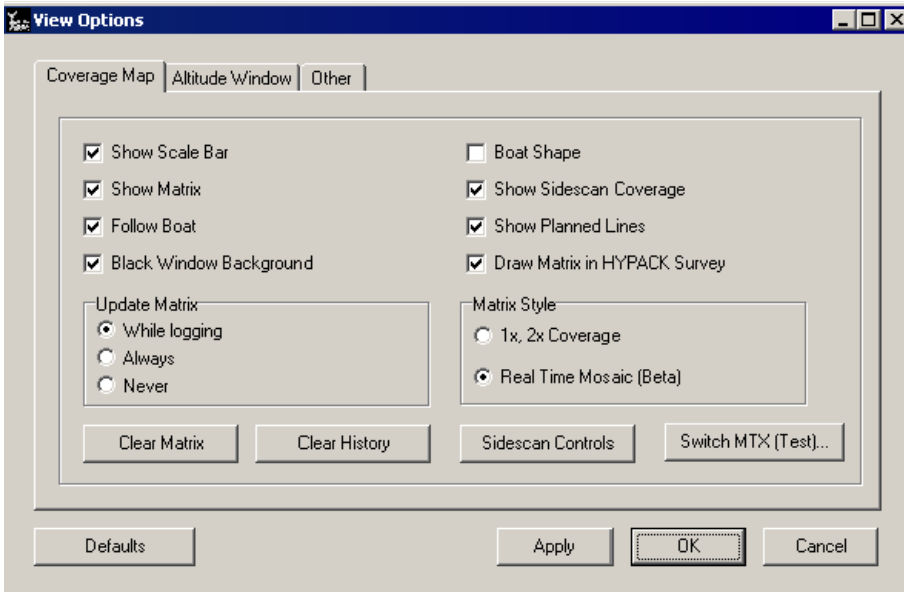
In SIDE SCAN SURVEY, your matrix file appears in the Coverage Map and can be used to track your side scan coverage in your survey area. *It does not save depth data*; instead, it increments the stored value in each cell each time it is painted. When the cell is filled for the first time, it is painted light gray. Any cell painted more than once will be dark gray.

NOTE Beginning in HYPACK® 2010, SIDE SCAN SURVEY supports multiple matrix files. One or more *HYSWEEP® type* matrix files should be enabled in your project when you launch SIDE SCAN SURVEY.

To check the matrix type, open the matrix file in the MATRIX EDITOR and check the Type field.

Matrix options are set in the Coverage Map tab in the View Options dialog. Files are automatically updated and saved at program close.

FIGURE 3-22. *Matrix Options*



The **Draw Matrix in HYPACK® SURVEY** option determines whether the matrix will be displayed in the HYPACK® SURVEY Area Map as well as in the SIDE SCAN SURVEY Coverage Map.

NOTE: You must also select the **Show Matrix** option.

Update Matrix options control when SIDE SCAN SURVEYpaints the matrix in the Coverage Map window *and when side scan data is passed to SURVEY.*

BEWARE! If you are painting the matrix in HYPACK® SURVEY, you must update the matrix in SIDE SCAN SURVEY *at least as often* as you update your matrix in HYPACK® SURVEY. If the matrix update setting is less frequent in SIDE SCAN SURVEY, it cannot supply the data required to accurately paint the matrix in HYPACK® SURVEY.

Matrix Style:

- **1x 2x Coverage** increments the matrix color according to the number of times the cell has been covered.
- **Real Time Mosaic** colors the matrix according to the return intensity.

TIP: If you select this option, use the HYPACK® Colors dialog to set your colors to mimic the Side Scan Waterfall display and the color combinations offered in the side scan controls. To do this, set the bands to range from 0 to 255 and select one of the predefined side scan options in the Color Options list.

[Clear Matrix] empties the matrix file.

More Information

- "Side Scan Coverage Map" on page 3-87
- "Saving Soundings to a Matrix in SURVEY" on page 3-54

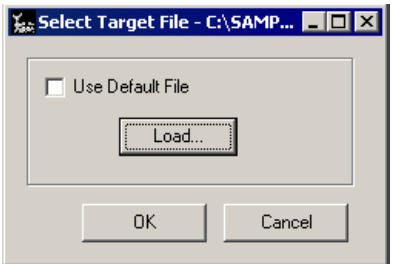
TARGETING AND TARGET FILES IN SIDE SCAN SURVEY

LOADING TARGET FILES TO SIDE SCAN SURVEY

Target files may be pre-defined in HYPACK®. Alternatively, you may allow SIDE SCAN SURVEY to create new target files on-the-fly.

Select TARGET-FILE to make your choice.

FIGURE 3-23. *Selecting a Target File*



Use Default File tells the program to create a target file named by the current date.

[Load] presents a File Selection dialog for you to choose the target file to which you want to add any targets you may mark.

Beware!

BEWARE! **It is possible to add targets to two different Target files** as this option is also available in HYPACK® SURVEY.

If you have loaded different Target files to HYPACK® SURVEY and SIDE SCAN SURVEY, a new target will be added to the Target file specified *from the currently selected program*.

For example: You have loaded HS.tgt from HYPACK® SURVEY and SS.tgt from SIDE SCAN SURVEY. If a HYPACK® SURVEY window is selected and you press F5, the target will be added to HS.tgt. Likewise, if a SIDE SCAN SURVEY window is selected and you press F5, the target will be added to the SS.tgt.

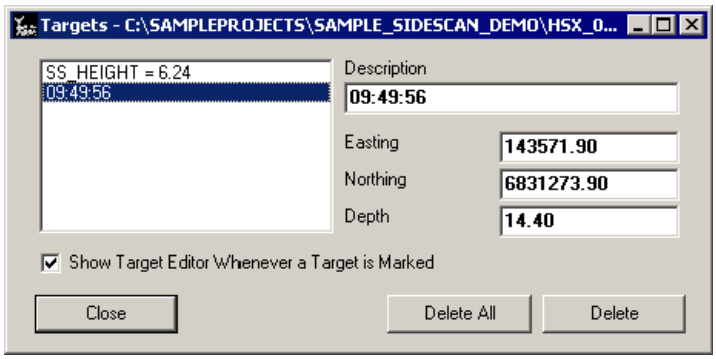
Marking Targets During SIDE SCAN SURVEY

Mark a target in the real-time waterfall or coverage map displays using any of the following methods:

- **Select TARGETS-QUICKMARK (F5)** to mark the position of the boat origin.
- **Double-click the location** .

By default, a Targets dialog will appear for you to edit the file entry. You can avoid this by clearing the **Show Target Editor** check box.

FIGURE 3-24. *Targets Dialog*



The Targets dialog enables you to modify the target properties by selecting a target from the list on the left and revising the data on the right.

To access this dialog without marking a target select TARGETS-EDIT TARGETS.

Marking Targets in the Height Measurement Dialog

You can mark a target from the Height Measurement dialog at the location of the object you are measuring. Click [Target] and the Target Properties dialog will appear with the coordinates where you clicked to initiate the dialog.

More Information

- “Measuring Object Height” on page 3-85

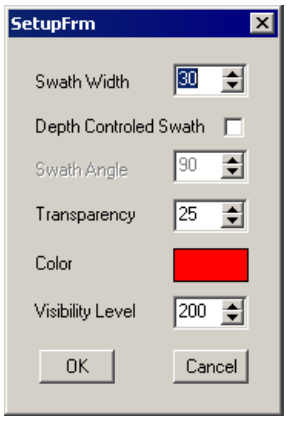
Using the Coverage Driver to Monitor Side Scan Coverage

The Coverage driver draws a series of contiguous polygons to a DIG chart file representing the area covered by your survey. This chart file is saved to your project folder.

Each time you start line, a colored swath draws to the Area Map according to the parameters in the Coverage Driver setup. Though you set these parameters initially in HYPACK® HARDWARE, the device

window for the Coverage.dll in SURVEYenables you to modify your settings in real time during SURVEY.

FIGURE 3-25. *Coverage.dll Setup Dialog*



The swath width can be user-defined or calculated.

- **User-defined Swath Width:** Clear the Depth Controlled Swath option and enter a Swath Width. SIDE SCAN SURVEYdraws polygons of user-defined width and centered on the vessel tracking point.
- **Calculated Swath Width:** Check the Depth Controlled Swath option and enter the angle of your swath. SIDE SCAN SURVEY draws the polygons based on depth information and the Swath Angle.

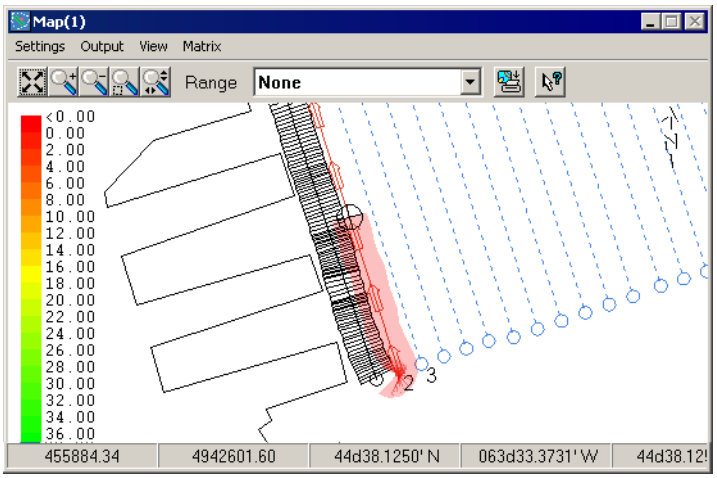
Transparency enables you to see features behind the swath (such as charts). Areas where you have achieved 200 percent coverage will be a darker shade of the user-defined swath **color.**

Visibility Level allows you to adjust the draw order of the swath in the SIDE SCAN SURVEY display. (It is probably easier to accept the default and modify the draw order in SIDE SCAN SURVEY.)

Each time you end line, these swaths are saved in the project folder to a DIG chart file with the same root file name as the corresponding raw data file. The Area Map in SURVEY automatically displays each DIG chart.

TIP: To minimize the file number, you can periodically consolidate the DIG files into a DXF chart in the EXPORT program.

FIGURE 3-26. *Coverage.dll displays in the Area Map in SURVEY*

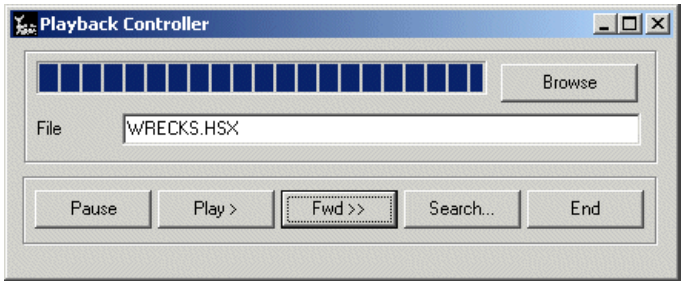


SIDE SCAN PLAYBACK

SIDE SCAN SURVEY will replay any HSX file recorded by HYSWEEP® or SIDE SCAN SURVEY.

Select FILE-PLAYBACK (F8) to access the Playback Controller.

FIGURE 3-27. *Playback Controller*



[Browse]: Pick a file for playback.

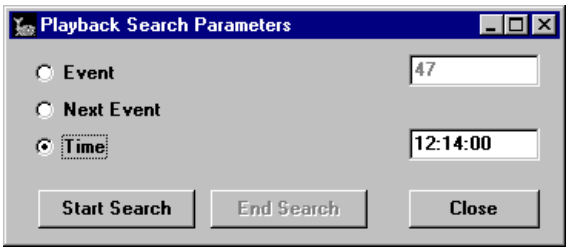
[Pause]: Temporarily suspend playback.

[Play>]: Playback in real time.

[Fwd>>]: Forward at 20 x real time.

[Search]: Activates search dialog. You can go directly to a specific event, to the next event from your current position in the playback, or to a specific time. Select choice and define the event or time you are looking for then click [Start Search].

FIGURE 3-28. *Playback Search Parameters*



[End]: End playback.

HYSWEEP® SURVEY

HYSWEEP® SURVEY is a multibeam and side scan data collection and logging program. Real-time displays and quality control testing give on-the-spot information on bottom conditions and data quality.

The HYPACK® and HYSWEEP® SURVEY programs run simultaneously, with HYPACK® providing navigation and single beam data collection and HYSWEEP® providing the multibeam features.

Data is logged XTF format, then processed through the HYSWEEP® EDITOR. The playback mode replays HYSWEEP® SURVEY files giving the same view seen on the boat.

Start HYSWEEP® SURVEY by selecting HYSWEEP-HYSWEEP SURVEY.

HYSWEEP® SURVEY DISPLAY WINDOWS

There are several display windows which may be displayed through HYSWEEP® for real-time monitoring of your data collection. In addition to those discussed in the following sections, HYSWEEP® SURVEY also includes the Side Scan Waterfall and Side Scan Signal windows.

Most windows have a tool bar at the top, providing shortcuts to window configuration. Pass the mouse pointer over a tool to see a hint as to what the tool does. Tool bars are toggled on / off with the F10 key.

All of the windows can be resized and moved around the screen, retaining it's size and position until changed. VIEW-TILE WINDOWS will arrange the currently open windows in a manner that attempts to optimize your viewing in each window.

More Information

- "Side Scan Waterfall Window" on page 3-85
- "Side Scan Coverage Map View Options" on page 3-92

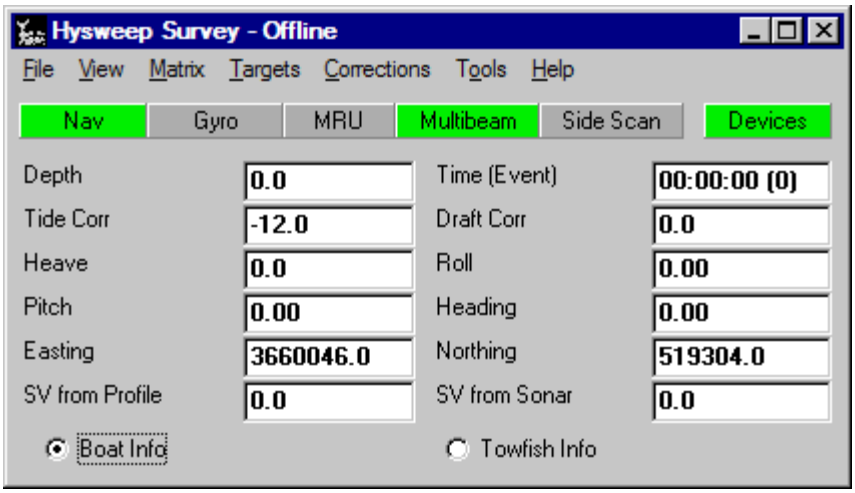
MAIN WINDOW IN HYSWEEP® SURVEY

The main window consists of a menu, some indicators and some measurements. It can be resized to show only items of interest and will retain the size on subsequent program runs.

The title bar gives logging and playback status. "Offline" is shown when neither logging nor playback is active. The current data file is shown when logging or playback is active.

You can choose to display data relative to the boat or to the towfish by selecting the option at the bottom of the dialog.

FIGURE 3-1. *HYSWEEP® SURVEY Shell*



ALARMS IN HYSWEEP® SURVEY

HYSWEEP® SURVEY can be configured to continuously check for and notify you of data errors or loss of data input. They show green (OK), yellow (careful) or red (look out) depending on status. Click the indicator to show status history.

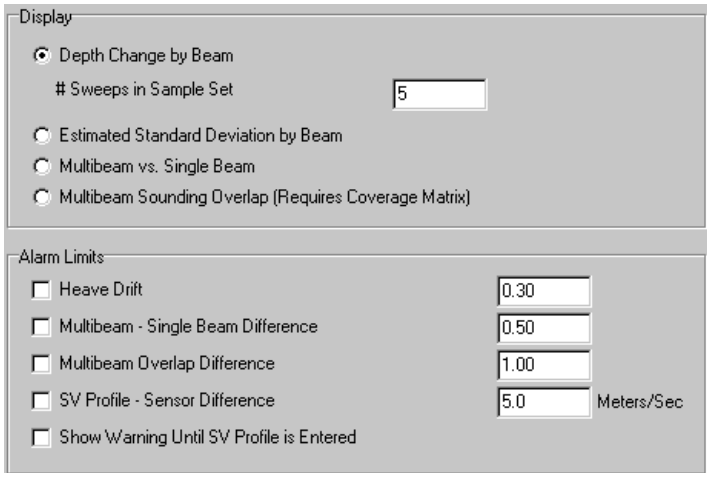
The **Nav, MRU, Gyro, Side Scan** and **Multibeam** alarms at the top of main window of HYSWEEP® turn red when no data has been received from the corresponding device for 10 seconds.

The **Devices** alarm turns red when no data has been received for a period longer than the Time Out Interval that you set for each device in the hardware setup.

There are alarms for heave drift, excessive multibeam–single beam difference and excessive multibeam overlap difference and several other problematic conditions.

To set up the alarms and limits, select VIEW-OPTIONS-QC Test and choose your alarms and limits.

FIGURE 3-2. View Options—QC Test Tab



HYSWEEP® SURVEY MEASUREMENTS

The measurements displayed in the HYSWEEP® SURVEY shell are updated about once a second. They include the following:

Depth: Nadir beam depth in survey units.

Time (Event): Latest sounding time and event number. Time will not update if no soundings are being received.

Tide Corrections: Latest tide correction from HYPACK® SURVEY.

Draft Corrections: Latest dynamic-draft correction from HYPACK® or from the HYSWEEP® squat & settlement table.

Heave: Latest heave in survey units, positive upward.

Roll: Latest roll in degrees, positive port side up.

Pitch: Latest pitch in degrees, positive bow up.

Heading: Latest ship heading.

Easting / Northing: Latest grid position from HYPACK® SURVEY.

SV from Profile is the current sound velocity correction from the sound velocity profile entered under CORRECTIONS-SOUND VELOCITY.

SV from Controller is the current sound velocity correction from the sensor. If there is no sound velocity sensor, it will display the sound velocity value entered in the sonar controller.

More Information

- "Sound Velocity Corrections in HYSWEEP® SURVEY" on page 3-131

PROFILE WINDOW IN HYSWEEP® SURVEY

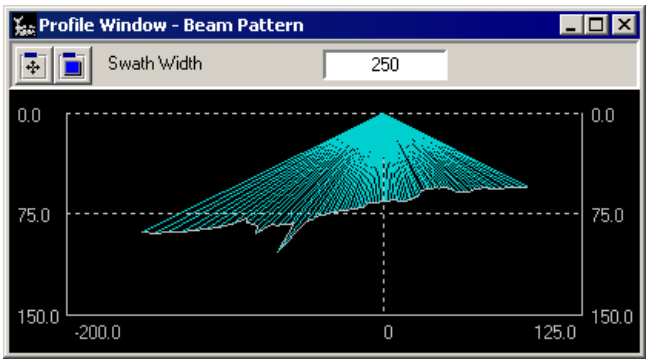
The Profile window shows sweep profiles in various ways:

- a profile line

- the beam pattern (shown)
- a bizarre wave-front display.

Only the profile line is available with multiple transducer systems. The view is looking forward from behind the sonar..

FIGURE 3-3. *Profile Window*



This display is limited to 75 beams and the swath width is displayed in the status bar. Note the color of the beams. The coding is such that blue indicates good data, yellow marginal and red bad. The relationship between color and beam quality code is established under VIEW-OPTIONS-Other.

To show the Profile Window, select VIEW-PROFILE WINDOW from the HYSWEEP® SURVEY menu. Display settings for the Profile Window are set by selecting VIEW-OPTIONS then RANGE SETTINGS and MULTIBEAM DISPLAY.

More Information

- “Range Settings in HYSWEEP® SURVEY” on page 3-123
- “Multibeam Display Settings in HYSWEEP® SURVEY” on page 3-124

3D Seafloor in HYSWEEP® SURVEY

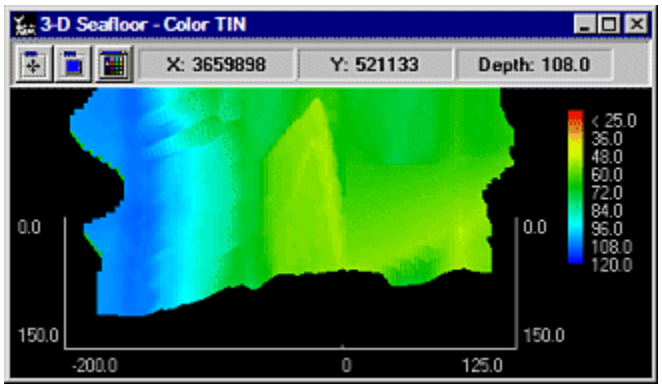
The 3D Seafloor window shows a three-dimensional representation of the aft seafloor. The view is through the rear-view mirror, which is somewhat odd but is the only way to draw these 3Dimensional images effectively. Display methods are:

- 3D Wiggle
- Color Wire Frame
- Solid TIN
- Color TIN (shown)

F11 toggles scrolling on / off and is useful to freeze the frame in case something interesting shows up. Moving the cursor across the window displays grid position and depth. Contacts may be targeted by double

clicking the object of interest and object size is measured by dragging the cursor from point to point.

FIGURE 3-4. *3D Seafloor*



To show the 3D Seafloor, select VIEW-3D SEAFLOOR from the main HYSWEEP® SURVEY menu. Display settings may be set by selecting VIEW-OPTIONS then Range Settings and Multibeam Display.

More Information

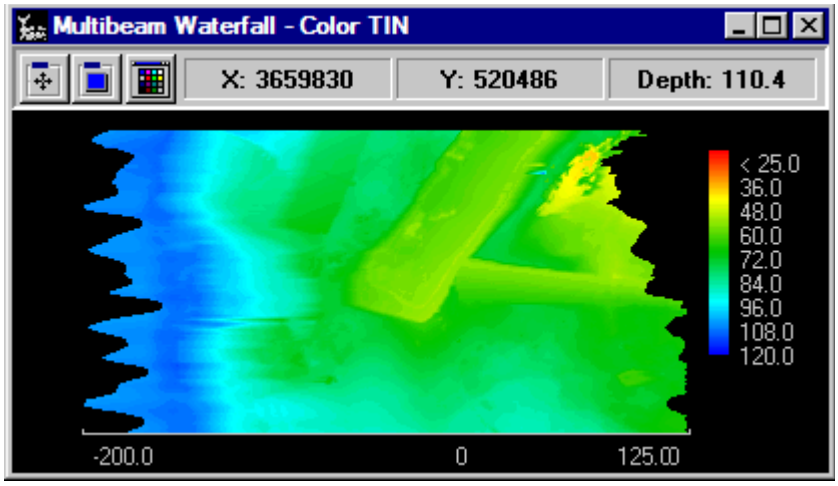
- "Range Settings in HYSWEEP® SURVEY" on page 3-123
- "Multibeam Display Settings in HYSWEEP® SURVEY" on page 3-124

MULTIBEAM AND INTENSITY WATERFALLS IN HYSWEEP® SURVEY

The Multibeam and Intensity Waterfall windows are forward-looking representations of the seafloor shown as a gray or color TIN. The original multibeam waterfall can be colored based on intensity instead of depth, however the Intensity Waterfall provides a better display.

The waterfall is a more traditional display method than the 3D view.

FIGURE 3-5. *Multibeam Waterfall*



F11 toggles scrolling on / off and is useful to freeze the frame in case something interesting shows up. Moving the cursor across the window displays grid position and depth. Contacts may be targeted by double clicking the object of interest and object size is measured by dragging the cursor from point to point.

To access this window, select VIEW-MULTIBEAM WATERFALL from the main HYSWEEP® SURVEY menu. Display settings may be set by selecting VIEW-OPTIONS then Range Settings and Multibeam Display.

More Information

- "Range Settings in HYSWEEP® SURVEY" on page 3-123
- "Multibeam Display Settings in HYSWEEP® SURVEY" on page 3-124

COVERAGE MAP AND CROSS SECTION WINDOWS IN HYSWEEP® SURVEY

The Coverage Map views the survey area from above. It has a number of features and options.

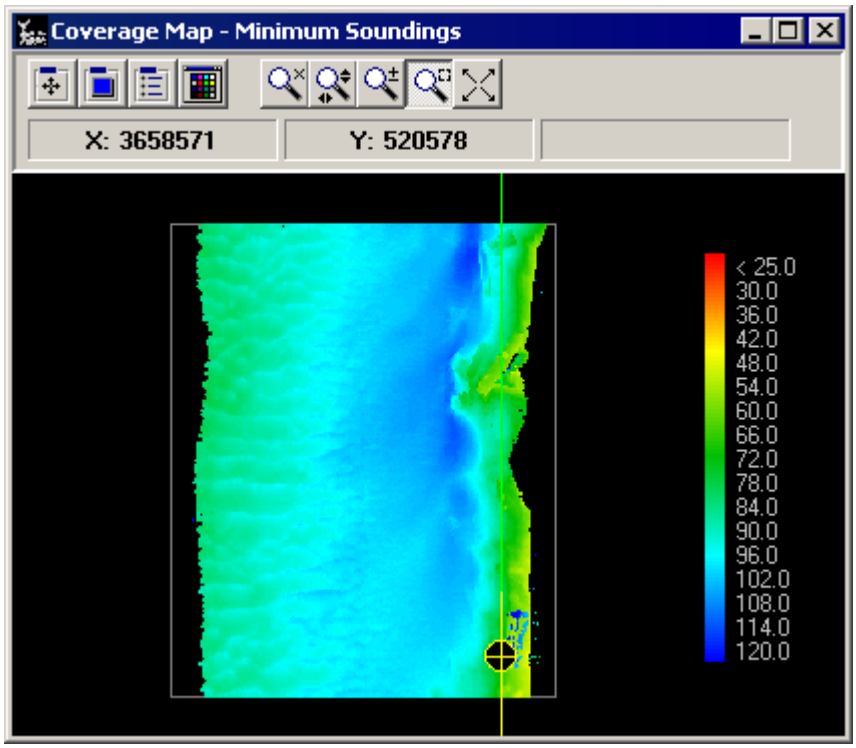
- **Multibeam and side scan coverage** as scan lines
- **Color-coded matrix display** showing depths according to the options set in the matrix view options.

  NOTE: This requires a HYSWEEP® type matrix.

- **Planned survey line display.**
- **A tool bar** for cutting cross sections, panning and zooming.
- **Distance and color scale bars.**
- **Boat tracking**

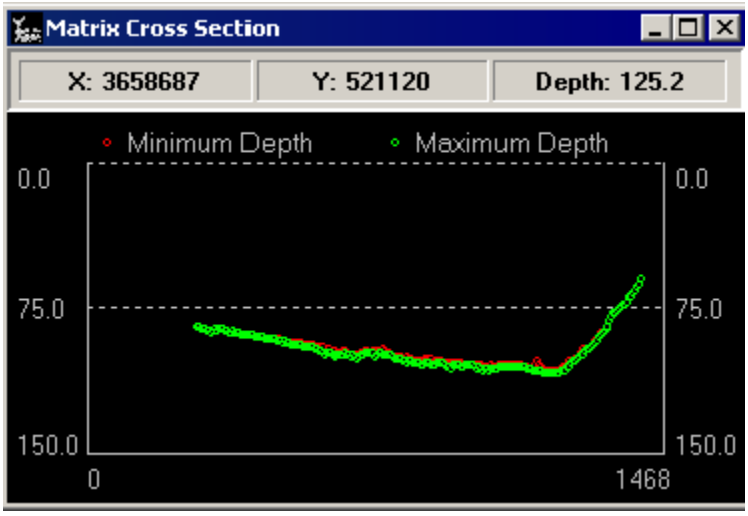
- **Current sweeps** colored differently to distinguish them from previous sweeps and assist navigation.
- **Contacts may be targeted** by double-clicking the object of interest.
- **Object size is measured** by dragging the cursor from point to point.
- **F11 toggles scrolling on/off** . This is useful to freeze the frame in case something interesting shows up.
- **Cursor position display:** Moving the cursor across the window displays grid position and depth.

FIGURE 3-6. *Coverage Map*



To cut a cross-section through the sounding matrix, click the cross-section tool and drag the section line across the matrix. The cross section will be displayed in a separate window.

FIGURE 3-7. Matrix Cross Section



To access the Coverage Map, select VIEW-COVERAGE MAP from the main menu. Display settings may be set by selecting VIEW-OPTIONS then coverage map (or the using the icons on the toolbar), and through the Matrix menu options.

More Information

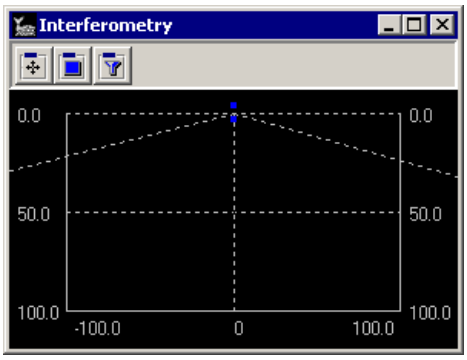
- "Coverage Map Settings in HYSWEEP® SURVEY" on page 3-126
- "Matrix Files in HYSWEEP® SURVEY" on page 3-133

INTERFEROMETRY WINDOW

The Interferometry window displays all data from an interferometer. If the device filters the data before sending it to the survey computer, flagging data outside of its filter criteria. You may honor the flags generated by the device or choose for HYSWEEP® SURVEY to ignore them by checking the 'Ignore manufacturer flags' option in the Interferometry Options dialog.

Data flagged as 'bad' by the filters are red; good data is green. If filters are enabled in the Interferometry Options dialog, the boundaries are shown in blue.

FIGURE 3-8. Sample Interferometry Window



Any of the interferometry options may be modified while logging if you choose.

More Information

- "Interferometry Logging Options" on page 3-137

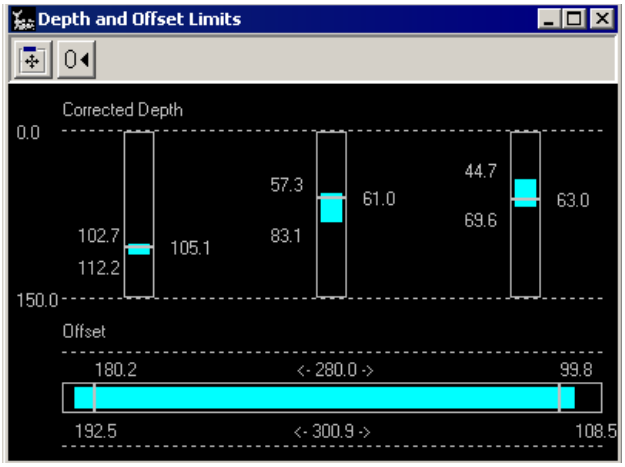
LIMITS WINDOW

The Limits window shows information about the depth and width of the sweep.

- The **Corrected Depth** displays data from the outer beam on each side and the nadir beam. The depths on the left of each graph show the minimum to maximum depths read from that beam. The depths on the right show the current depth reading.
- The **Offset display** shows the width of the sweep. The top numbers are the width of the most recent reading. The bottom numbers show the maximum distances to either side of the nadir beam and the total of the two values.

Access the Limit window using VIEW-LIMITS. Display settings may be set by selecting VIEW-OPTIONS-RANGES.

FIGURE 3-9. *Limits Window*



More Information

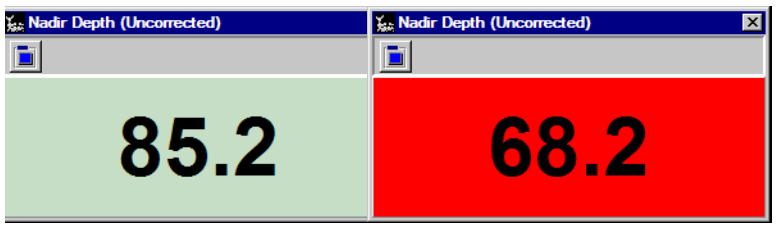
- "Range Settings in HYSWEEP® SURVEY" on page 3-123

NADIR WINDOW IN HYSWEEP® SURVEY

The Nadir Depth window displays the current, uncorrected nadir depth. It may also be configured to display a red background if the depth returned by the sensor falls below a user-defined limit.

In the following example, the alarm limit was set to 70 survey units. At 85.2, the background is green but red at depths less than 70.

FIGURE 3-10. *HYSWEEP® SURVEY Nadir Window*



More Information

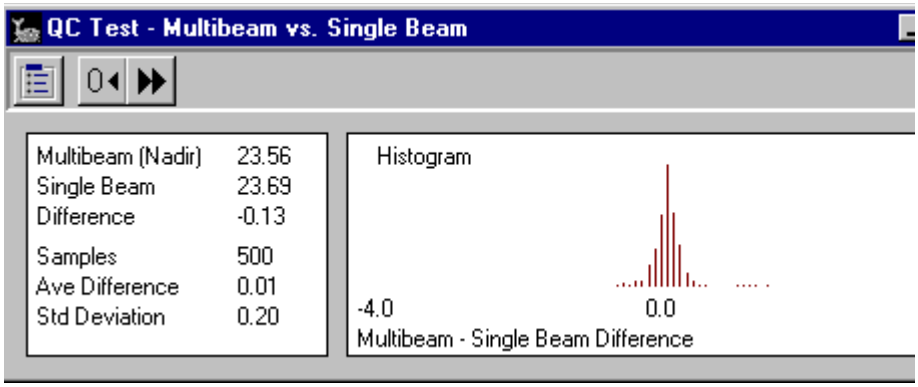
- "Multibeam Display Settings in HYSWEEP® SURVEY" on page 3-124

QC TEST WINDOW HYSWEEP® SURVEY

The QC Test window shows the results of one of four HYSWEEP® quality control tests.

- **Depth change by Beam:** Shows the depth change of each beam over a specified number of pings. Faulty beams and incorrect attitude compensation show up clearly in this test.
- **Standard Deviation by Beam:** Approximates the standard deviation of each beam over the last 500 pings using the method of Eeg[1]. May be used in flat areas to assess overall sounding precision.
- **Multibeam vs. Single Beam:** Compares multibeam nadir with single beam. Useful for validating the multibeam sonar against the more traditional (and more widely accepted as correct) single beam echosounder.

FIGURE 3-11. *Multibeam vs. Single Beam Comparison*



- **Multibeam Sounding Overlap:** Provides multibeam overlap statistics within matrix cells. May be used in flat areas to validate multibeam system calibration.

All of these tests make some approximations and work better over a flat surface. An example of the multibeam vs. single beam test is shown in the screen capture. The problem with this test over variable bottom terrain is that the wide-angle single beam transducer sounds a wider area per ping than the narrow nadir beam, resulting in a slight shoal bias for the single beam.

To access this window, select VIEW-QC TESTS from the main HYSWEEP® SURVEY menu. Set display settings by selecting VIEW-OPTIONS then QC Tests tab.

More Information

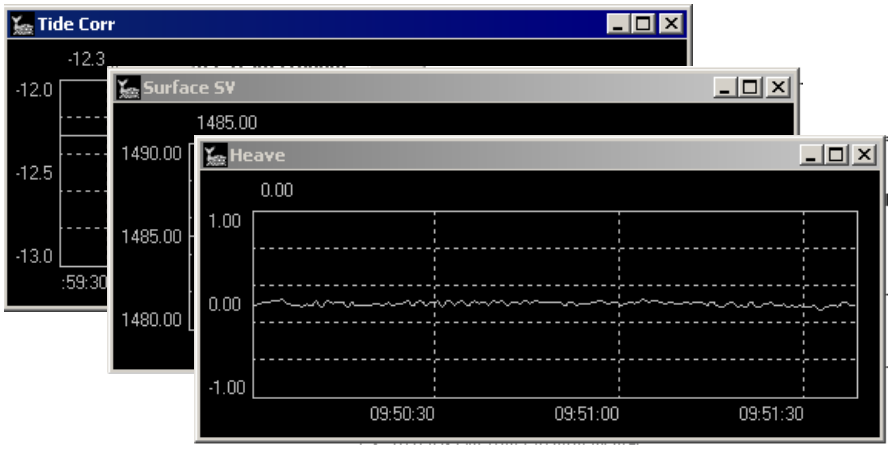
- "QC Test Settings in HYSWEEP® SURVEY" on page 3-125

1. Eeg, Jorgen: On the Estimation of Standard Deviation in Multibeam Soundings. The Hydrographic Journal, No. 89, July 1998.

TIME SERIES WINDOWS

Three time series windows graph Surface Sound Velocity, Heave and Tide Correction (one value per window) in real-time.

FIGURE 3-12. *Sample Heave Window*



TOTAL PROPAGATED UNCERTAINTY IN THE HYSWEEP® SURVEY

Total Propagated Uncertainty (TPU*)* calculations attempt to account for all possible causes of error in your survey data and how they affect each other.

Based on the general, environmental and sensor data entered in the TPU EDITOR and real-time sounding data, SURVEY calculates and displays three uncertainty values:

- **Total Sounding Uncertainty:** Level of confidence in the depth value, calculated based on Depth 1 in dual frequency surveys and on the nadir beam of multibeam surveys.
- **Total Positioning Uncertainty:** Level of confidence in the horizontal positioning of the sounding.
- **Target Size Limit Value:** Minimum size object likely to be found given the sounding and positioning uncertainties.

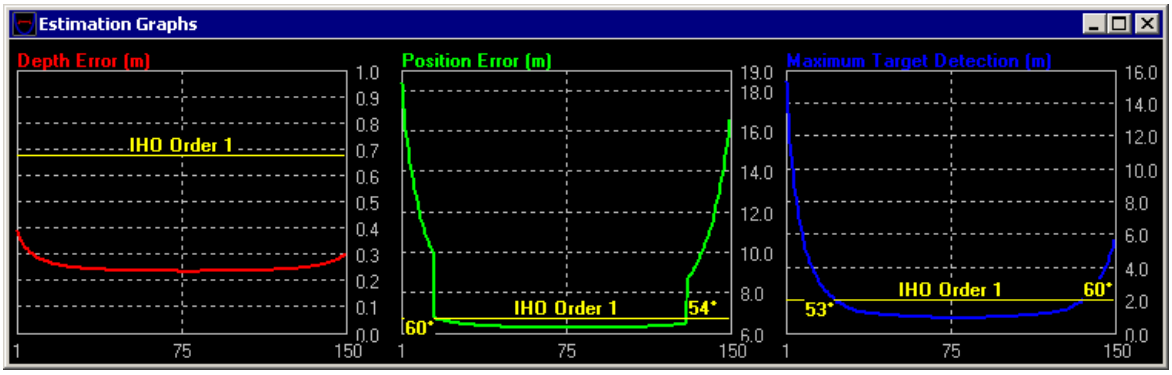
NOTE: *With the exception of the Total Sounding Uncertainty in single beam surveys*, these values are not recorded; *they are for display purposes only.*

You can compare the each uncertainty display against the following IHO and USACE specifications in the HYSWEEP® TPU windows.

- IHO Special Order Requirements
- IHO 1st Order Requirements
- USACE Hard Bottom Requirements
- USACE Soft Bottom Requirements

To view one or more of the TPU windows in HYSWEEP® SURVEY, select VIEW-TOTAL PROPAGATED UNCERTAINTY and check the graph you want to view.

FIGURE 3-13. *Sample TPU Windows*



MESSAGE WINDOW IN HYSWEEP® SURVEY

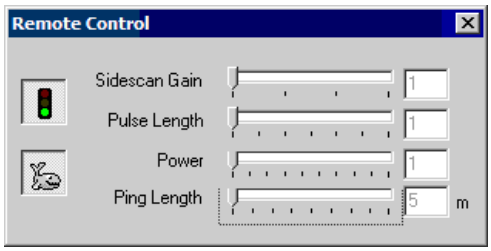
The Message window is a scrolling display of all messages read over an Ethernet device. You can pause the scrolling to study the content by clicking [Pause]. Click [Resume] to continue scrolling.

You may also record these messages to Message.txt, an ASCII text file stored in the HYPACK® install folder by checking the box.

DEVICE CONTROL WINDOWS IN HYSWEEP® SURVEY

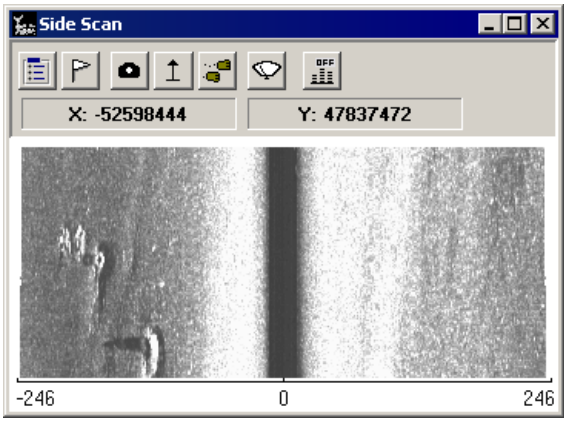
The HYSWEEP® SURVEY Tools menu includes two control dialogs--one for multibeam devices and one for side scan devices. These controls communicate directly with the device without exiting the survey programs.

FIGURE 3-14. *Geoswath Remote Control*



SIDE SCAN WATERFALL WINDOW

FIGURE 3-15. *Side Scan Waterfall Window*



This is the traditional side scan display (forward looking and without slant range corrections) to which most hydrographers are accustomed. Reflection brightness and contrast are adjustable through the side scan controls and cursor position is shown in either X/Y or lat/lon in the status bar.

To access the Side Scan Waterfall window, select VIEW-SIDE SCAN WATERFALL from the main menu.

To display in lat/lon, check the 'Display Positions in Lat/Lon' option in the View Options dialog.

The normal speed of the Side Scan Waterfall is constant, but the speed of your vessel generally is not.

To adjust the speed to match the speed of the survey vessel, click the **Speed Compensation** icon. It displays objects and shapes in the scan in more realistic proportions (i.e. round objects look more round), but the display is not as smooth.

To access additional display settings, click the icon in the status bar.

A second Side Scan Waterfall window is available to support dual frequency units.

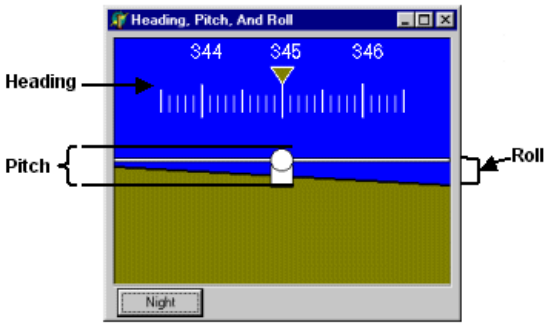
More Information

- "Side Scan Waterfall Controls" on page 3-93

GRAPHICAL MRU IN HYSWEEP® SURVEY

The Graphical MRU program shows Heading, Pitch and Roll in a real time, visual display.

FIGURE 3-16. Graphical MRU Display



The scale at the top of the window represents the heading.

The vessel is represented by the square in the center. When the vessel:

- **Is stationary**, the lines extending out on either side lie at the change from green to blue.
- **Rolls**, the diagram green/blue border rotates out of line with the horizon line by the amount of the roll.
- **Pitches**, the square moves vertically out of line with the circle by the amount of the pitch.

The Night button enables you to toggle between dark and light displays according to your survey environment.

This display reflects the motion of either the boat or the fish according to the vessel selected in the HYSWEEP® SURVEY shell.

DISPLAY SETTINGS IN HYSWEEP® SURVEY

The view options determine what data appears in the display windows and howthe windows should be configured to optimize the display.

- The **Device Selections dialog** is used to choose the source for each type of data displayed.

  To access the Device Selections dialog, select VIEW-DEVICE SELECTIONS.
- The settings in the **View Options** dialog determine how the data should be displayed. Each of the windows is configurable to a certain extent. Range settings are adapted to expected bottom depths, display styles are selected to the operators personal preference and need.

  To access View Options:
  - Select VIEW-OPTIONS from the shell menu.
  - Press the F9 key.

NOTE: The side scan windows have separate display options accessed from an icon in their windows.

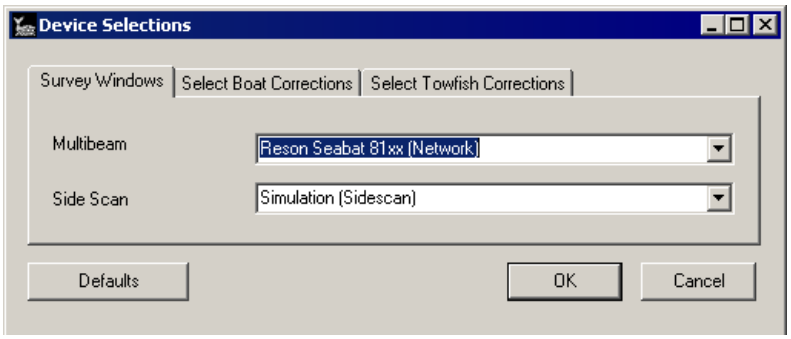
DEVICE SELECTIONS IN HYSWEEP® SURVEY

The Device Selections dialog is a three-tabbed dialog. Each drop-down listing is populated based on your hardware configuration.

[Default] sets each field to the first device of each description in your device list.

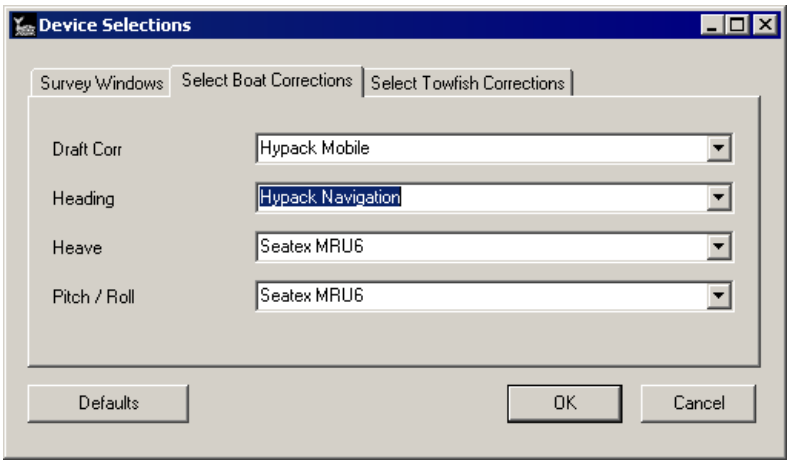
- In the **Survey Windows** tab, select the device from which your displayed data should be read.

FIGURE 3-17. *Device Selections Dialog - Survey Windows Tab*



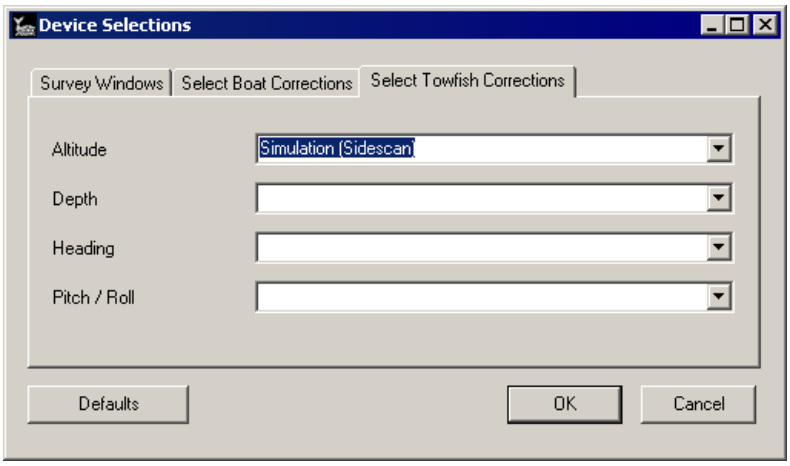
- In the **Boat Corrections** tab, select the device from which each value is read for the survey boat in your hardware configuration.

FIGURE 3-18. *Device Selections Dialog - Boat Corrections Tab*



- In the **Towfish Corrections** tab, select the device from which each value is read for the mobile in your hardware configuration.

FIGURE 3-19. Device Selections Dialog - Towfish Corrections Tab

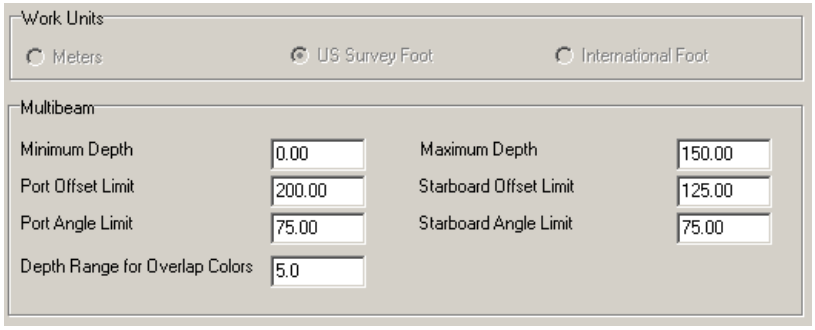


RANGE SETTINGS IN HYSWEEP® SURVEY

Click the Range tab to set depth, offset and angular display limits. Note that while these limits are used by the HYSWEEP® SURVEY display windows, they do not affect data logging. All soundings are logged, always, period.

Some of the range settings (multibeam depth, offset, angle and quality limits) are saved in data files for optional use in post-processing. This feature allows the surveyor, who knows the water he's working in, to control range settings for post-processing.

FIGURE 3-20. The Range Tab



Work Units: Select survey grid units, Meters, US Feet or International feet. This option is only available when HYSWEEP® SURVEY is run without HYPACK®. Otherwise the selections are disabled and work units are taken from your geodesy settings.

Multibeam:

- **Minimum Depth:** Enter minimum depth gate. No soundings above this depth are displayed.
- **Maximum Depth:** Enter maximum depth gate. (You can also increment and decrement this value by 5 using F2 and F3

respectively.) No soundings below this depth are displayed. This value also determines the resolution of the saved depth value (which is always saved in meters).

- **Max DepthResolution**

< 500 meters	0.01 meters
> 500 meters and < 5000 meters	0.10 meters
<5000 meters	1.00 meters

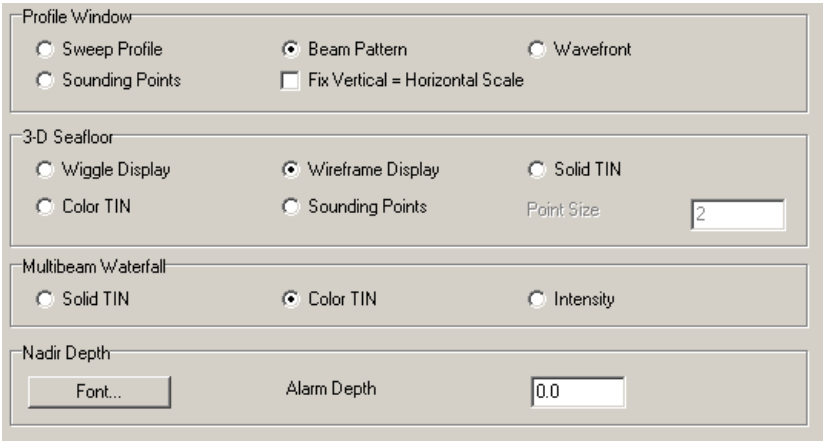
- **Port Offset Limit:** Maximum horizontal sounding offset allowed for display (port side).
- **Starboard Offset Limit:** Maximum horizontal sounding offset allowed for display (starboard side).
- **Port Angle Limit:** Maximum beam take-off angle (from vertical) to the port side. Beams at angles greater than this setting are not displayed.
- **Starboard Angle Limit:** Maximum beam take-off angle (from vertical) to the starboard side.
- **Depth Range for Overlap Colors:** When a matrix is displayed in the Overlap method, depth differences are color coded from 0 to this value.

NOTE: Depth, offset and angle limits also affect interferometric data when it is filtered by display limits.

MULTIBEAM DISPLAY SETTINGS IN HYSWEEP® SURVEY

The Multibeam Display Settings control the style and coloring of the multibeam displays.

FIGURE 3-21. *Multibeam Display Tab*



Profile Window:

- **Sweep Profile** shows the bottom profile of each sweep.

- **Beam Pattern** shows each beam with color-coding based on quality.
- **Wave front** shows the sounding wave front and backscatter points.
- **Sounding Points:** Each sounding is shown as a color-coded dot of user-defined Point Size (pixels). The point size is defined in the 3D Seafloor options.
- **Fix Vertical=Horizontal Scale** keeps the view from being stretched disproportionately in either direction which causes some distortion.

3D Seafloor:

- **Wiggle** shows a succession of sweep profiles.
- **Wire frame** shows a wire frame seafloor model with depth color-coding.
- **Solid TIN** shows a TIN model with illumination.
- **Color TIN** shows a TIN model with depth color-coding.
- **Sounding Points:** Each sounding is shown as a color-coded dot of user-defined Point Size (pixels).

Multibeam Waterfall:

- **Solid TIN** shows a TIN model with illumination.
- **Color TIN** shows a TIN model with depth color-coding.
- **Intensity:** If your echosounder has the capability of measuring the strength of the return signal, this can be represented in gray scale. A stronger return is represented by a lighter color.

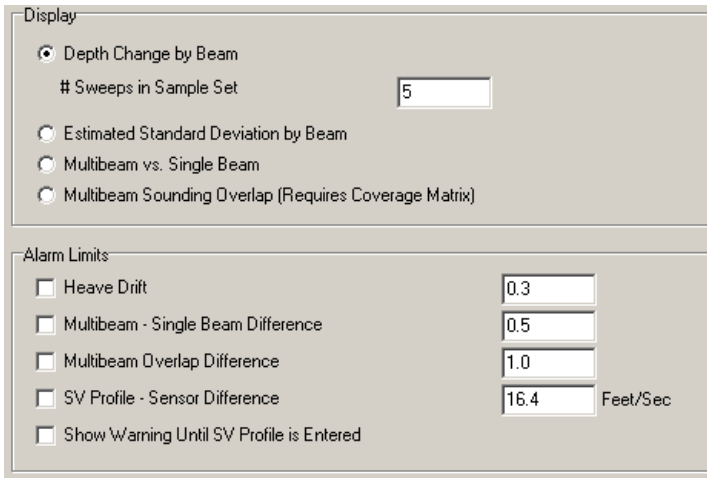
Nadir Depth:

- **Alarm Depth** defines the minimum depth you expect. If the depth drops below this limit, the background of the Nadir Depth window will turn red.

QC Test Settings in HYSWEEP® SURVEY

QC Test Settings control the QC Test Window.

FIGURE 3-22. *QC Test Tab*



Display: Selects one of the four multibeam QC methods.

- **Depth Change by Beam:** Shows the depth change seen at each beam over the last N sweeps.
- **Estimated Standard Deviation:** Estimates the standard deviation of each beam over the last 100 sweeps.
- **Multibeam vs. Single Beam:** Provides multibeam vs. single beam statistics.
- **Multibeam Sounding Overlap:** Provides statistics on multibeam overlap. This test is only available when a matrix file is loaded.

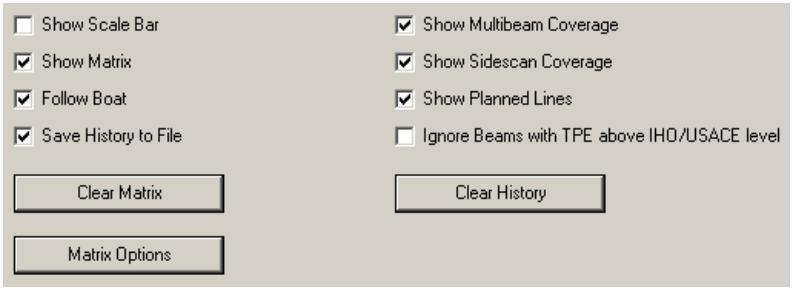
Alarm Limits: Enable QC alarms and set limits. Yellow indicators in the main window bring these alarms to the surveyors attention.

- **Heave Drift:** Alarm heave drift (over 10 seconds) beyond the limit. One must watch this closely on small boats because sharp turns can cause one or more foot of heave error.
- **Multibeam–Single beam Difference:** Alarm difference (over 500 samples) beyond the limit.
- **Multibeam Overlap Difference:** Alarm difference (averaged over all matrix cells) beyond the limit.
- **SV Profile –** Sensor Difference: Shows an alarm if the difference between the sound velocity correction from the sensor and the first value in the Sound Velocity Profile is greater than the user defined amount.
- **Show Warning Until SV Profile is Entered** provides an alarm if you have not loaded your sound velocity corrections. Of course (unless you are using the EM2000, EM3000 or EM3002 driver, which preprocesses your data) you can add or change these corrections during post-processing by loading a Sound Velocity Corrections file (*.VEL) in the HYSWEEP® EDITOR.

COVERAGE MAP SETTINGS IN HYSWEEP® SURVEY

Coverage Map settings allow you to define which objects are displayed in your coverage map.

FIGURE 3-23. *Coverage Map Tab*



Show Scale Bar: Displays the distance scale bar.

Show Matrix: Displays the sounding matrix. This option is enabled only if you are drawing your soundings to HYSWEEP® SURVEY.

Follow Boat: Re-centers map when the boat leaves the screen.

Show Multibeam Coverage: Displays multibeam sweep lines while logging.

Show Side Scan Coverage: Show side scan lines while logging.

Show Planned Lines: Displays the planned survey lines.

Save History to File saves the coverage information when you exit HYSWEEP® SURVEY. It automatically displays when you resume data collection to assure complete coverage of your survey area. **[Clear History]** deletes the contents of the file.

Ignore Beams with TPU above IHO/USACE level sets the Coverage Map to paint cells only when IHO Criteria are met. The sounding data is still logged to the raw data file regardless of the TPU status.

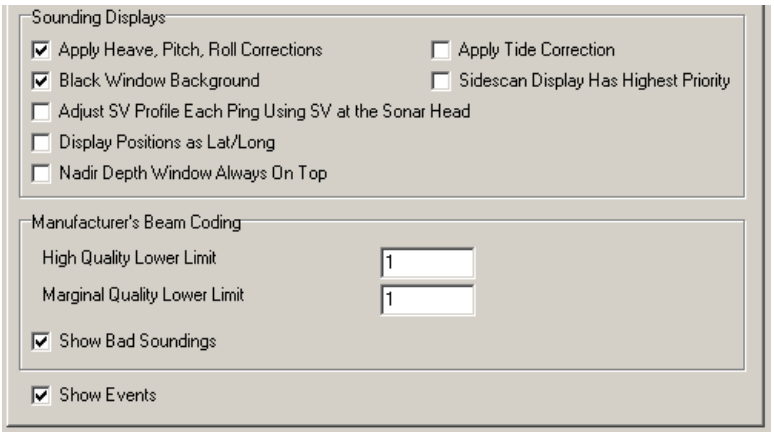
[Clear Matrix]: Clear matrix file of all sounding data.

[Matrix Options]: Select matrix display options.

[Clear History]: Clear multibeam and side scan coverage lines.

OTHER DISPLAY SETTINGS IN HYSWEEP® SURVEY

FIGURE 3-24. *The Other Tab*



Apply Heave, Pitch, Roll Corrections and **Apply Tide Corrections:** Select whether or not to apply these corrections to the multibeam soundings before display.

Black Window Background: Select black or white window background. As of this writing, displays over a White background are pretty bad.

Adjust SV Profile Each Ping Using SV at the Sonar Head: If your sounder has a surface sound velocity probe, the sound velocity at the sonar head is recorded by HYSWEEP® SURVEY in real time. This

option updates the SV profile with the value reported by the sound velocity probe.

Display Positions as Lat/Long: The default setting displays position information as XY. Check this box if you prefer lat/lon.

Nadir Depth Window Always on Top prevents the Nadir Depth window from being covered by any other. This could be particularly important if you are using it as an alarm to warn you of shoals.

Side Scan Display Has Highest Priority guarantees every scan will be drawn to the Side Scan Waterfall window providing the clearest image possible. If this is not checked, logging data gets the precedence. If your computer is fast enough, it should be able to do both, but it is your responsibility to check for complete data files.

Manufacturer's Beam Coding: Assign as sounding quality based on quality codes received from the multibeam echosounder. The Profile window color-codes soundings based on quality: high = blue, marginal = yellow, bad = red.

- **High Quality Limit:** All soundings greater than or equal to this value are assumed good.
- **Marginal Quality Limit:** All soundings less than this value are assumed bad.
- **Show Bad Soundings:** Selects display of bad sounding data.

Show Events annotates the 3D Seafloor; bathy; and intensity, sidescan and shore waterfall displays at each event.

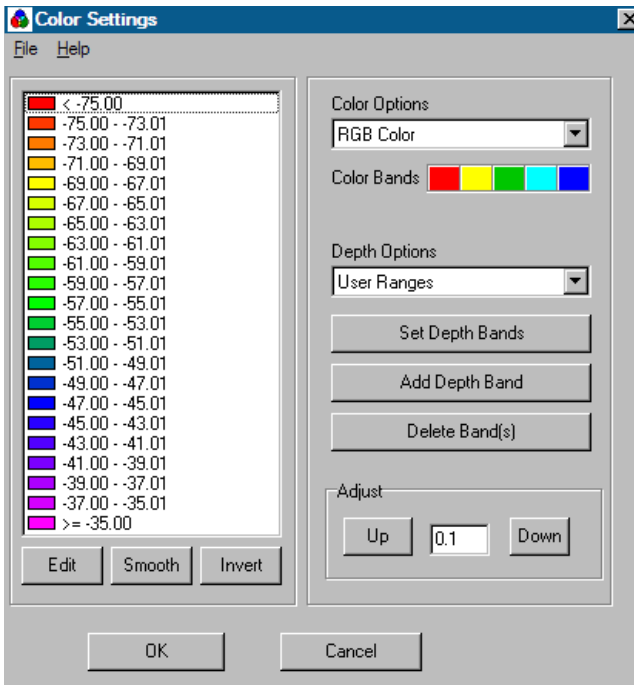
COLOR SETTINGS IN HYSWEEP® SURVEY

The Multibeam Waterfall, 3D Seafloor and Coverage Map windows all include an icon in their tool bars, to access the standard Color dialog where you can adjust your project colorsas you would in HYPACK®. The dialog in HYSWEEP® SURVEY shows an additional option.

Auto-Scale: When selected, the color range is calculated dynamically based on depth statistics.

The colors can be distributed over a user-defined depth range by deselecting this option and setting the minimum and maximum color depth values.

FIGURE 3-25. Standard Color dialog



FILES AND FILENAMES IN HYSWEEP® SURVEY

When HYSWEEP® SURVEY is run in combination with HYPACK®, it bases data and target file names on theHYPACK® names. With minor changes of course, so the names aren't identical. When HYSWEEP® SURVEY is run stand alone, it has it's own naming scheme.

Raw file folder: Uses HYPACK® raw data folder.

Catalog Filenames: "HSX_" + HYPACK® catalog name.

Data Filenames: HYPACK® data filename + ".HSX"

Target File Folder: Uses HYPACK® target folder.

Default Target Filenames: "HSX_" + HYPACK® target filename.

NOTE HSX means HYSWEEP® SURVEY extension

CORRECTIONS IN HYSWEEP® SURVEY

TIDE CORRECTIONS IN HYSWEEP® SURVEY

HYSWEEP® SURVEY gets real-time tide corrections from HYPACK® SURVEY. This is done automatically through the shared memory mechanism.

More Information

- "Tide Corrections in SURVEY" on page 3-63

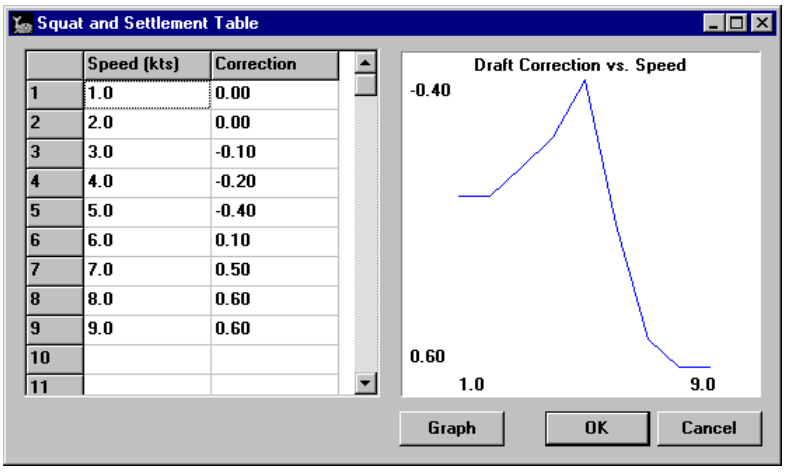
DYNAMIC DRAFT CORRECTIONS IN HYSWEEP® SURVEY

HYSWEEP® SURVEY has two methods for application of dynamic draft correction:

- **To take dynamic draft corrections from SURVEY** (whether you enter them manually or use the draft table). This is the default setting.
- **To use the Squat and Settlement Table** available in HYSWEEP® SURVEY.

  To enter a squat & settlement table, select CORRECTIONS-SQUAT AND SETTLEMENT and enter the draft correction values (in survey units) versus speed (in knots). When a table is entered, HYSWEEP® SURVEY calculates the dynamic draft correction from boat speed (from GPS via HYSWEEP® SURVEY) and the table.

FIGURE 3-26. *Squat and Settlement Corrections Table*



NOTE If you are using tides with HYPACK® (which presumably you are since you're reading this) you do not need to enter any draft corrections.

The GPS.dll subtracts the dynamic draft correction to compute the

"true" tide correction. Without a draft correction, the driver will still calculate a correct chart sounding, but the RTK Tide value will be different from the conventional tide value.

SOUND VELOCITY CORRECTIONS IN HYSWEEP® SURVEY

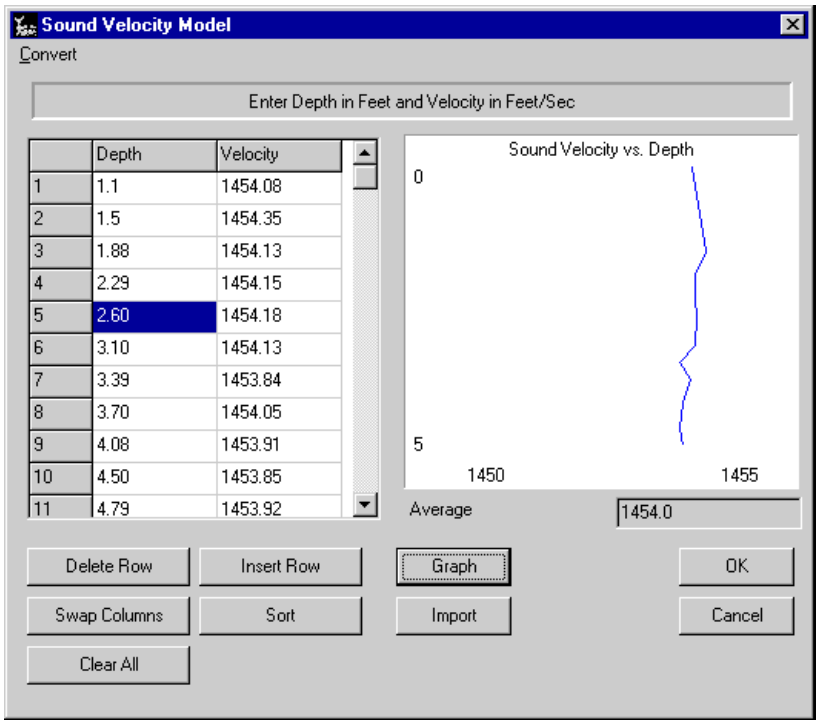
Sound velocity corrections can be applied, statically or dynamically, during survey. They may also be applied during post-processing, but applying corrections in real-time is the preferred method as it provides corrected depths and stores the correction values to the headers of the raw files.

STATIC SOUND VELOCITY CORRECTIONS

For static corrections, a sound velocity model is entered or imported from your sound velocity cast using the main menu CORRECTIONS-SOUND VELOCITY option. The model is recorded into the data files for use in post-processing.

NOTE If there is a pre-existing Sound Velocity Profile when you enter HYSWEEP® SURVEY, the multibeam alarm will show yellow. It's a good idea to verify it is accurate before you begin to collect data. The alarm will turn off when you click [OK] in the sound velocity model.

FIGURE 3-27. *Sound Velocity Model*



HYSWEEP® SURVEY uses the average sound velocity calculated from the model for display calculations instead of the more time-consuming ray path calculations used in post-processing.

Units selects the units of the model. Conversion to HYSWEEP® SURVEY working units is done automatically.

- Meters, M/Sec: Depth is in meters, velocity is in meters per second.
- Feet, Ft/Sec: Depth is in feet, velocity is in feet per second.

To manually enter the model:

Type the depth and sound velocity values into the spreadsheet in increasing depth order. To check for errors, click **[Graph]** when you're done.

Dynamic Sound Velocity Corrections

For multibeam surveys, HYSWEEP® SURVEY includes a sound velocity corrections table where you should enter (or import) the sound velocity profile information after each cast. This information is recorded to the header of each multibeam raw file (*.HSX).

Alternatively, the Odim MVP (Moving Vessel Profiler™) probe performs regular sound velocity casts while your survey vessel is underway. The HYPACK® MVP device driver stores its data to shared memory which automatically updates the HYSWEEP® sound velocity profile table. It can also record the data from each cast to a VEL file for use in post-processing.

In post-processing, the HYSWEEP® EDITOR can read one or more sound velocity correction files and apply corrections based on these depth, sound velocity pairs in place of those recorded during survey.

To import a sound velocity profile:

1. **Click [Import] and select the file recorded by your profiler** then the Import Form is shown.
2. **Check the Accept box next to the two fields that represent the depth and sound velocity correction values.** This tells the program which two values to read from the displayed record.
3. **Accept the data for your Sound Velocity Corrections file.**
   - **If your depth and correction values are always in the same position, as suggested, click [Accept All]** and the program will extract the selected fields from each line in the file.
   - **If the value position varies, click [Accept Record].** The program will copy only the displayed values to your Sound Velocity Corrections file, then display the values from the next line of the text file. This allows you to step through your text file, one line at a time, changing the position designations (select new checkboxes) before accepting each record or skipping lines all together ([Skip Record]). Continue through your file until you have all of the values in your corrections file that you need.

4. **Click [OK]** to return to the SOUND VELOCITY spreadsheet. The selected data will listed in the spreadsheet and graphed in the SOUND VELOCITY dialog.
5. **If the depths and correction values have been reversed in the spreadsheet, correct them by clicking [Swap Columns].**
6. **If your depths are not in chronological order, Sort your depths** by clicking [Sort].

LOGGING DATA IN HYSWEEP® SURVEY

Data logging may be controlled by HYPACK® SURVEY or HYSWEEP® SURVEY. Logging commands are passed between the two programs to keep them in the same mode.

You may control logging in HYSWEEP® SURVEY using:

- Menu commands
- The same keyboard shortcuts as HYPACK® SURVEY.

NOTE Data can not be logged for three seconds before and after midnight. During this time, HYSWEEP® SURVEY will close the current data files and open new ones named according to the new date and time.

TABLE 3-1. *HYSWEEP® SURVEY Keyboard Shortcuts.*

FILE-HYPACK® Commands-	Keyboard Shortcuts
START LOGGING	Ctrl + S
END LOGGING	Ctrl + E
SUSPEND LOGGING	Ctrl + U
RESUME LOGGING	Ctrl + R

You can log data in a selection of formats according to the selection in the Logging Options dialog.

MATRIX FILES IN HYSWEEP® SURVEY

Two of the most useful features in HYSWEEP® SURVEY–the color-coded coverage map and multibeam overlap statistics – are available only when a matrix file is loaded. Matrix files are simply areas divided into cells. The files are created in the MATRIX EDITOR.

Matrix files enabled in your project automatically load into HYSWEEP® SURVEY which will load and unload the individual matrix files, depending on the vessel location. When you close the program, files automatically update and save.

TIP: Typically, if you are logging multibeam data, you should use one or more *HYSWEEP® type* matrix files and paint them in HYSWEEP® SURVEY. This provides data storage capabilities greater than if you were to paint a matrix of either type in HYPACK® SURVEY.

Beware!

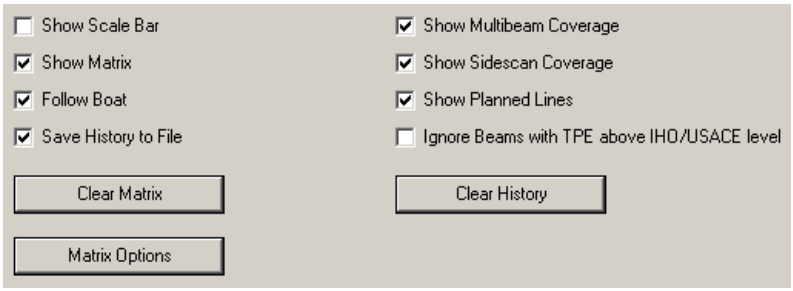
BEWARE! You can paint a HYPACK® matrix in HYSWEEP®, but *the filled matrix will not be saved* when you exit HYSWEEP® SURVEY.

TABLE 3-2. *HYPACK® vs HYSWEEP® Matrix Files*

Matrix Type	Paint in HYPACK® SURVEY	Paint in HYSWEEP® SURVEY
HYPACK®	• Maximum • Minimum • Last	MTX will paint but *will not save*!
HYSWEEP®	• Maximum • Minimum • Last	• Minimum • Maximum • Average • Overlap (Max-Min) • Coverage

In HYSWEEP® SURVEY, the matrix options are in the Coverage Map tab of the View Options dialog.

FIGURE 3-28. *View Options - Coverage Map Tab*

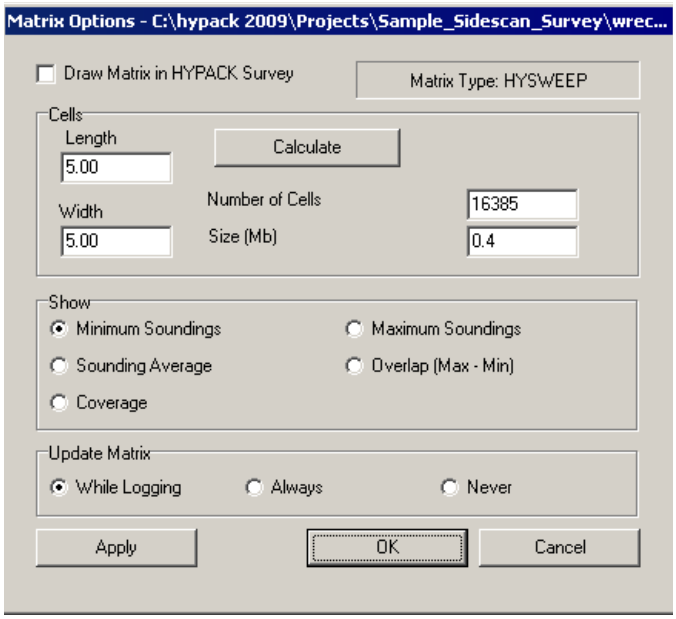


Show Matrix displays the matrix enabled in your project in the Coverage Map.

[Clear Matrix] erases the data from the matrix file.

[Matrix Options] accesses another dialog that controls how the matrix works in HYSWEEP® SURVEY.

FIGURE 3-29. Matrix Options



The **Draw Matrix in HYPACK® SURVEY** option determines whether the matrix will be displayed in the HYPACK® SURVEY Area Map as well as in the HYSWEEP® SURVEY Coverage Map.

IMPORTANT! If you check the Draw Matrix in HYPACK® SURVEY option, HYSWEEP® SURVEY passes its data to HYPACK® SURVEY through shared memory. The matrix will be painted *according to the matrix options in HYPACK® SURVEY* (i.e. minimum, maximum or last sounding in each cell).

NOTE: You must also select the **Show Matrix** option in the Coverage Map tab of the View Options.

Cells options enable you to modify the cell dimensions and calculate the effects.

BEWARE! If you edit the cell size in a "filled" matrix file, it will lose its depth content.

- **Length and Width:** Matrix files are given cell length and width when designed. The HYSWEEP® operator can override them here. If the matrix update process is excessively slow in the coverage map, make the cells larger until an acceptable speed is reached.
- **[Calculate]** Calculates the number of cells and approximates the total memory required for the matrix. If a matrix requires 256 Mb of memory and your computer only has 128 Mb, you need to make the cells larger.

Show options determine which value to display in HYSWEEP® SURVEY.

- **Minimum:** For each cell, show the minimum of all soundings falling within the cell.
- **Maximum:** Show maximum sounding.
- **Average:** Show the sounding average
- **Overlap:** Show sounding difference (Max–Min).
- **Coverage:** Show 1x / 2x multibeam coverage.

The **Update Matrix** options control when HYSWEEP® SURVEY paints the matrix in the Coverage Map window and when the survey data is passed to SURVEY.

TIP If you are painting the matrix in HYPACK® SURVEY, you should update the matrix in HYSWEEP® SURVEY *at least as often* as you update your matrix in HYPACK® SURVEY. If the matrix update setting is less frequent in HYSWEEP® SURVEY, it cannot supply the data required to accurately paint the matrix in HYPACK® SURVEY.

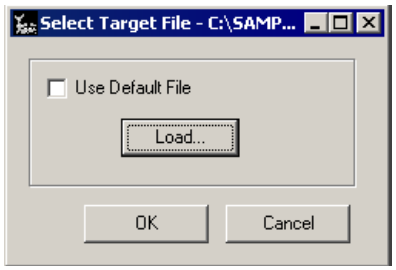
TARGETING AND TARGET FILES IN HYSWEEP® SURVEY

LOADING TARGET FILES TO HYSWEEP® SURVEY

Target files may be pre-defined in HYPACK®. Alternatively, you may allow HYSWEEP® SURVEY to create new target files on-the-fly.

Select TARGET-FILE to make your choice.

FIGURE 3-30. *Selecting a Target File*



Use Default File tells the program to create a target file named by the current date.

[Load] presents a File Selection dialog for you to choose the target file to which you want to add any targets you may mark.

BEWARE! **It is possible to add targets to two different Target files** as this option is also available in HYPACK® SURVEY.

For example: You have loaded HS.tgt from HYPACK® SURVEY and Swp.tgt from HYSWEEP® SURVEY. If a HYPACK® SURVEY window is selected and you press F5, the target will be added to HS.tgt. Likewise, if a HYSWEEP® SURVEY window is selected and you press F5, the target will be added to the Swp.tgt.

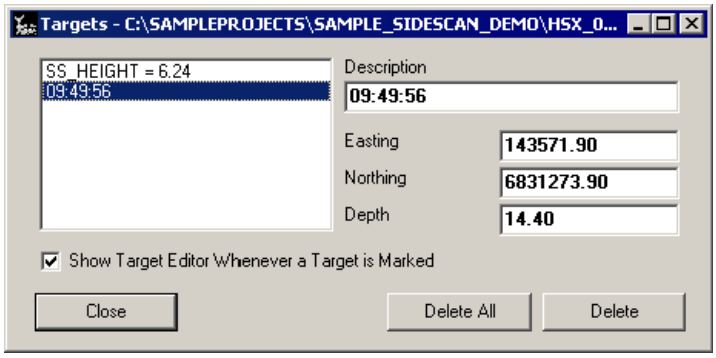
MARKING TARGETS DURING HYSWEEP® SURVEY

Mark a target in the real-time waterfall or coverage map displays using any of the following methods:

- **Select TARGETS-QUICKMARK (F5)** to mark the position of the boat origin.
- **Double-click the location** .

By default, a Targets dialog will appear for you to edit the file entry. You can avoid this by clearing the **Show Target Editor** check box.

FIGURE 3-31. *Targets Dialog*



The Targets dialog enables you to modify the target properties by selecting a target from the list on the left and revising the data on the right.

To access this dialog without marking a target select TARGETS-EDIT TARGETS.

INTERFEROMETRY IN HYSWEEP® SURVEY

Interferometry diagnoses the properties of two or more waves by studying the pattern of interference created by their superposition. In hydrography, the interferometer analyzes the way the waves in the ping returns overlap to precisely measure depths. Interferometric systems provide shallow water, wide swath bathymetry.

HYSWEEP® SURVEY supports several interferometers, however they typically output more than 1440 beams per ping—the maximum number allowed by HYSWEEP® SURVEY. For this reason, the data must be filtered and downsampled during data collection to be stored to the multibeam raw file (*.HSX). Filtering the data also removes extraneous data and improves bottom tracking.

Interferometry Logging Options

Some devices can filter the data before sending it to the survey computer, flagging data outside of its filter criteria. If you pre-filter the data, you may set HYSWEEP® SURVEY to honor the flags generated by the device or ignore them by checking the 'Ignore manufacturer flags' option in the Interferometry Options dialog.

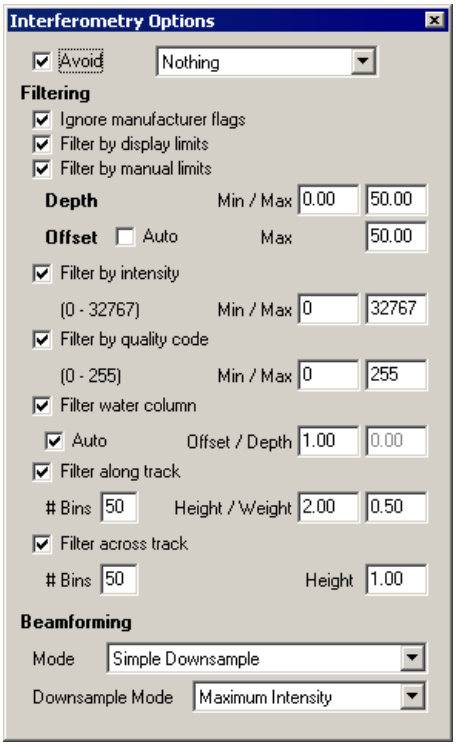
HYSWEEP® SURVEY has a series of filters for interferometric data, each potentially more restrictive than the previous filter. Each ping is evaluated by each filter *in order*. If the ping falls outside the limits of any filter, it is flagged and ignored in subsequent work with the data. Thus, a ping must comply with all enabled filters to be considered good data. Pings outside of the filter limits will be flagged and drawn to the Interferometry window in red while those that fall within all of the filter limits will be drawn in green.

Configure the filters in HYSWEEP® SURVEY in the Interferometry Options dialog. The filters are applied in the order they are presented in the dialog, top to bottom. Once data is flagged as bad, it is ignored by any subsequent filters.

Configuring your Filters

1. **Access the Interferometry Options dialog** by clicking the Interferometry Options icon in the Interferometry window toolbar.

FIGURE 3-32. *Interferometry Options —User-defined parameters are displayed for each selected filter option.*



2. **Select each filter you want to use.** If there are additional parameters for any selected filter, the appropriate fields will appear when the filter is selected.
   - **Avoid** options allow you to skip some of the processing *if the data is already sufficiently thin (ie < 1440 points)*.
     - "Avoid Any Processing" will do nothing unless the data exceeds 1440 points

- "Avoid Downsampling" will filter, but only beamform if the data exceeds 1440 points.

- **Filtering Options:** Typically, you need not use all of these. Points can be flagged on the basis of depth, offset, intensity, or quality code.
  - **Ignore Manufacturer Flags:** If the sonar pre-flags bad points, you must choose to honor or ignore them.
  - **Display limits** filters based on the depth, offset, and angle limits specified in the view options.
  - **Manual limits** allows you to specify limits that are not tied to your viewing limits. You can also set your offset limits to be a multiple of water depth.
  - **Intensity and quality code** simply filter by a specified min/max. Note that the drivers will scale intensity to a 0—32767 range and quality code to a 0—255 range. The meaning of these vary somewhat depending on the sonar.
  - The **water column** filter can track a single beam echosounder depth and reject points with a range less than that value.
  - The **along track** filter makes a user-specified number of bins of a specified height across the track, each bin vertically centered on what the filter recognizes as the current depth. Those samples falling within the bin are flagged good and affect the depth of the bin by a specified weight. The lower the weight, the slower the filter reacts to change.
  - The **across track** filter works similar to the along track option, but it does not remember bin depth from ping to ping. This filter is meant to be used with the along track filter, but with a smaller height.

3. **Set your beamforming options.** Two modes are provided:
   - **Simple downsample** will take the results of filtering and downsample to 1440 beams. You can opt to select by intensity, quality code, or average. This option retains the entire swath coverage, but the beam footprint will be necessarily reduced to compensate.

NOTE: Simple downsampling will retain vertical features such as quay walls while binning will average them out.

   - **Binning by horizontal offset:**. Given a bin footprint size, it will form a beam for each bin by averaging the good points in each bin, optionally weighted by intensity or quality. In this mode, the beam quality is set to the bin point count, and standard deviation and colinearity tests are run. If the bin data fails, the beam quality is set to 1. Binning guarantees the footprint resolution at the expense of a swath width which is limited to 1440 * bin size.

4. **Close the Interferometry Options dialog.** All settings are saved and applied when you close the dialog.
5. **Log some data while observing the effectiveness of your filters** in the Interferometry window.
6. **Modify the filters as necessary**. All interferometry filters can be toggled on and off by right-clicking on the Interferometry window and checking and unchecking the filter name in the pop-up menu. If you want to modify any of the filter parameters, you must return to the Interferometry Options dialog.

When your filter settings are working well, you're ready to survey.

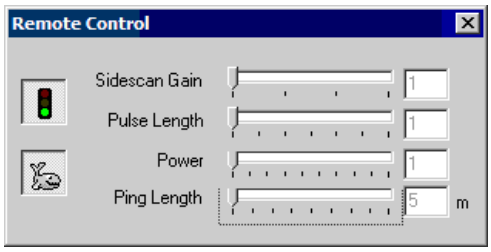
More Information

- "Range Settings in HYSWEEP® SURVEY" on page 3-123

REAL-TIME DEVICE CONTROLS

The HYSWEEP® SURVEY Tools menu includes two control dialogs--one for multibeam devices and one for side scan devices. These controls communicate directly with the device without exiting the survey programs.

FIGURE 3-33. *Geoswath Remote Control*



PLAYBACK IN HYSWEEP® SURVEY

HYSWEEP® SURVEY will play back any ASCII or binary file recorded by HYSWEEP® and multibeam files recorded by HYSWEEP® SURVEY in HYPACK® 8.9.Select FILE-PLAYBACK (F8) to access the Playback Controller.

FIGURE 3-34. Playback Controller

[Browse]: Pick a file for playback.

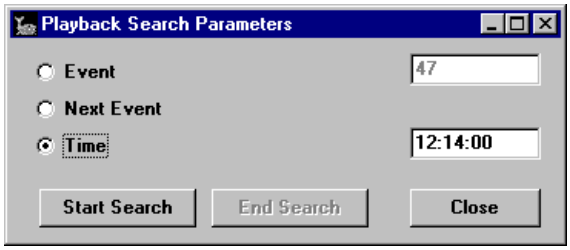
[Pause]: Temporarily suspend playback.

[Play>]: Playback in real time.

[Fwd>>]: Forward at 20 x real time.

[Search]: Activates search dialog. You can go directly to a specific event, to the next event from your current position in the playback, or to a specific time. Select choice and define the event or time you are looking for then click [Start Search].

FIGURE 3-35. Playback Search Parameters



[End]: End playback.

CHAPTER 4

Single Beam Processing

SINGLE BEAM PROCESSING OVERVIEW

There are many sounding selection and final product programs so the task sequence to process your data from raw data to your final product can be confusing. The following flowcharts should guide you along your way."

All single beam data should first be run the SINGLE BEAM EDITOR to apply tide and sound velocity corrections where required and edit out bad data. The resulting output is Edited All Format files. After that you have some choices.

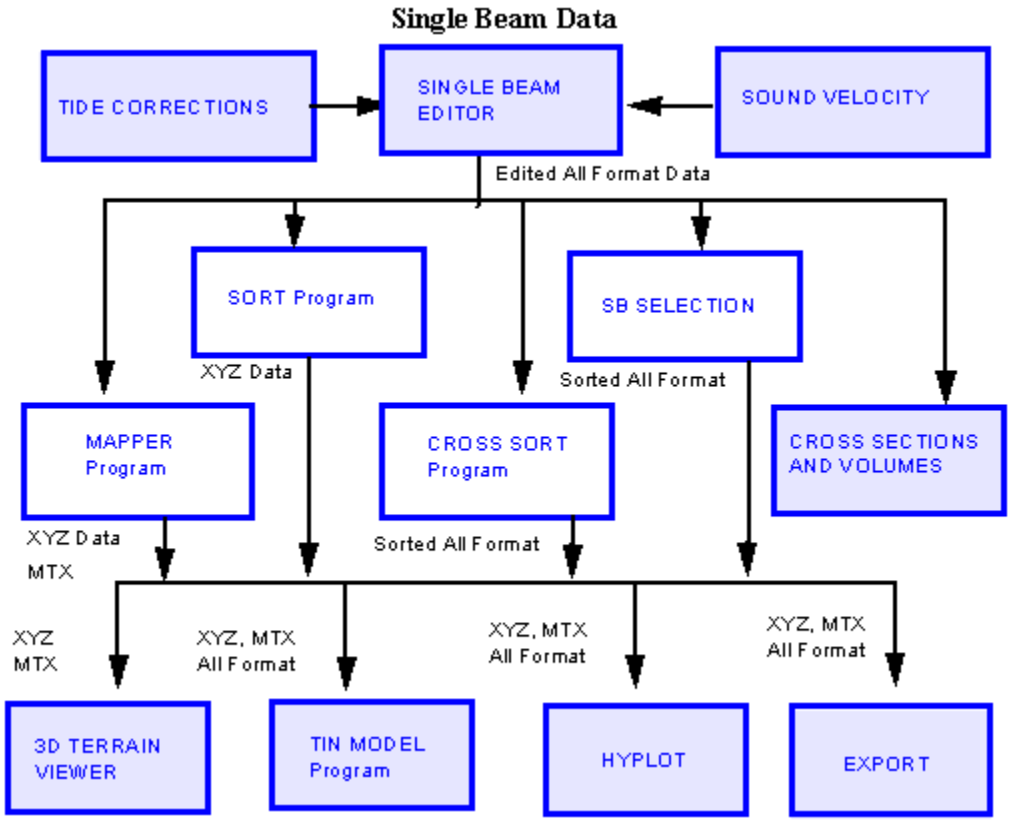
The Sounding Selection programs (SB Selection, SORT, CROSS SORT and MAPPER) are optional programs that reduce your data in an attempt to speed your final product calculations without adversely affecting the accuracy of the results. Choose which of these programs is best for you based on which selection methods you like the best and which file format you need to input to your final products program.

3D TERRAIN VIEWER builds its models from XYZ data or matrix files.

HYPLOT, TIN MODEL and EXPORT can all take either XYZ format or All format files so any of the sounding selection programs are available options if you want to reduce your data.

The CROSS SECTIONS AND VOLUMES program requires the channel template information found only in All Format files. It is not recommended to thin your data for volumes calculations in CROSS SECTIONS AND VOLUMES as it can adversely affect the accuracy of the results.

FIGURE 4-1. *Single Beam to HYPLOT, TIN MODEL, EXPORT or 3D TERRAIN VIEWER*



PREVIEWING YOUR SOUNDINGS IN THE MAIN WINDOW

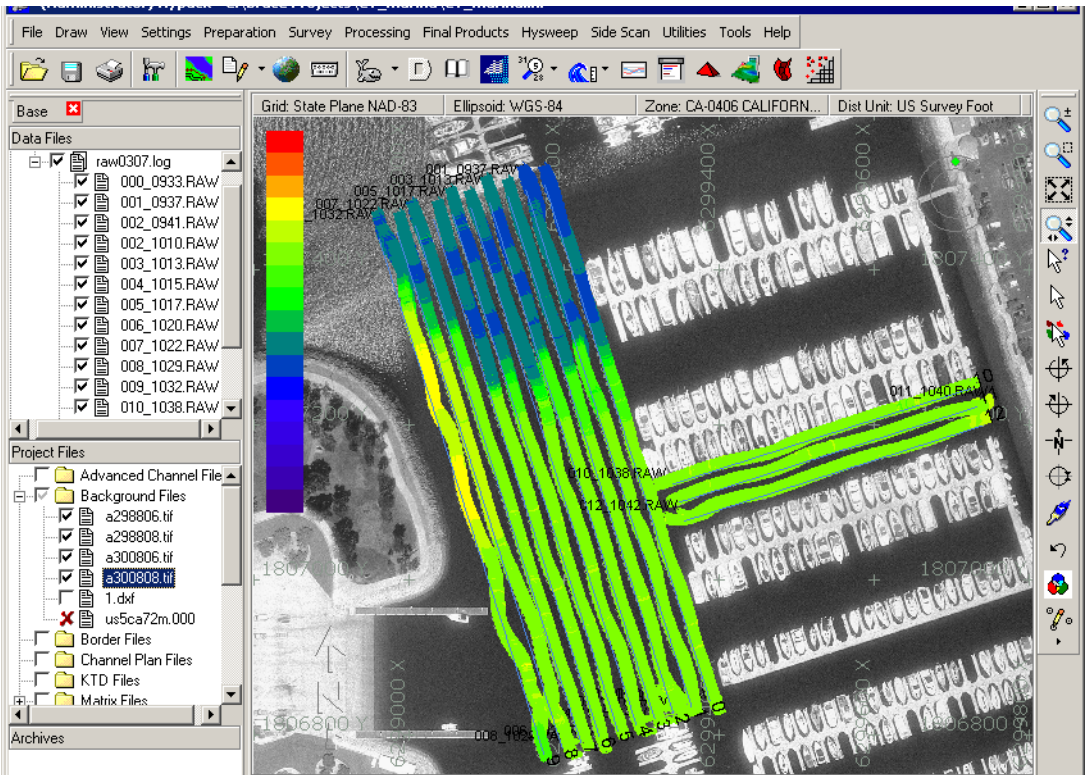
There is nothing worse than thinking your are finished with a survey, packing up the boat and gear, driving 1,000 miles back to the home office only to discover that line 13 was not surveyed. It is usually a good practice to check your RawData Files in the main window to see if there are any problems.

The HYPACK® map window displays non-binary files that are enabled in the Project Files List at the left. Use the DRAW menu and the Project Files List to view your files.

- **DRAW-DISABLE PROJECT FILES** disables all except the sounding files in the current project. It does not delete the files; it just omits them from being drawn to the screen. This includes all of your planned lines, background files, etc.

- **DRAW-DISABLE DATA FILES** disables just the data files in the current project. They are not erased, but just omitted from the screen view.
- **DRAW-DRAW FILES** adds a file to your project and draws it to the screen. You may also right click the file type at the left, select Add File and choose the file to draw.

FIGURE 4-2. *Drawing Data and Project Files to the Screen*



SOUND VELOCITY CORRECTIONS

Sound Velocity Corrections files are generated in the SOUND VELOCITY program and contain depth vs sound velocity data. They are used to correct soundings for variations of sound in the water column. In most shallow-water, small-boat surveys, the echosounder is calibrated for the range of soundings encountered and no sound velocity corrections are needed. For multibeam surveys and deep-water surveys, sound velocity corrections are used to provide more accurate soundings.

For single beam surveys, sound velocity corrections are defined in the SOUND VELOCITY program and saved to a sound velocity correction file (*.VEL). This file is then loaded into the SINGLE BEAM EDITOR. The editor calculates ray-bending corrections to sounding data as it is read into the editor.

For multibeam surveys, HYSWEEP® SURVEY includes a sound velocity corrections table where you should enter (or import) the sound velocity profile information after each cast. This information is recorded to the header of each multibeam raw file (*.HSX).

Alternatively, the Odim MVP (Moving Vessel Profiler™) probe performs regular sound velocity casts while your survey vessel is underway. The HYPACK® MVP device driver stores its data to shared memory which automatically updates the HYSWEEP® sound velocity profile table. It can also record the data from each cast to a VEL file for use in post-processing.

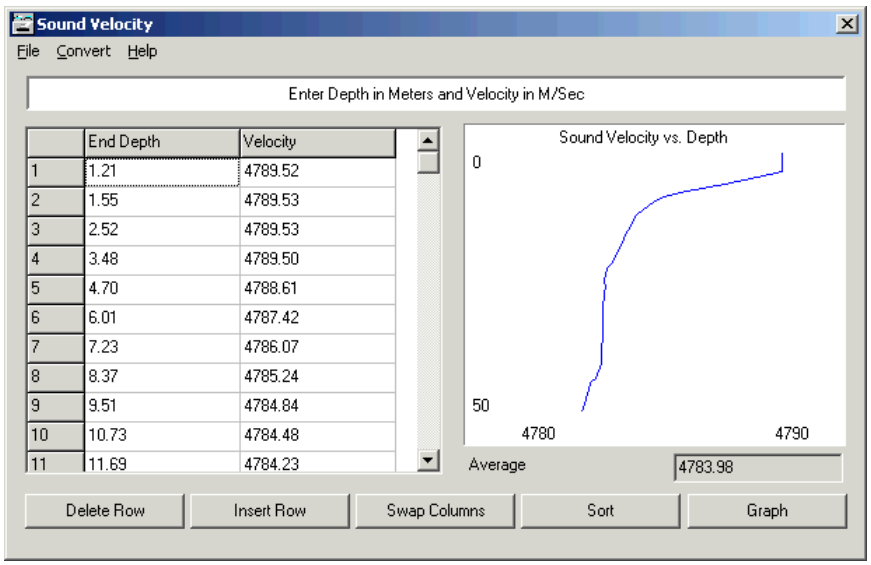
In post-processing, the HYSWEEP® EDITOR can read one or more sound velocity correction files and apply corrections based on these depth, sound velocity pairs in place of those recorded during survey.

The sound velocity correction assigned to each sounding record is determined by the depth value, and the depth ranges and correction values specified in your table.

CREATING A SOUND VELOCITY FILE IN THE SOUND VELOCITY PROGRAM

1. **Start the SOUND VELOCITY program** by selecting PROCESSING-SOUND VELOCITY. The Sound Velocity spreadsheet will appear.

FIGURE 4-1. *Sound Velocity Spreadsheet*



2. **Enter your Depth vs. Velocity information** into the Sound Velocity spreadsheet. The depth is entered in survey units, while velocity is always in meters/second.

In the SINGLE BEAM EDITOR, sound velocity corrections are not interpolated; the same value is assigned to all depths in the same range. In the previous figure, depths from 0 to 1.21 get a correction of 4789.52, depths of 1.22 to 1.55 get a correction of 4789.53, etc.

In the HYSWEEP® EDITOR, you can choose this method (the line method) or the arc method. The arc method assumes a constant velocity change between V1 and V2 which calculates an arced ray path.

You can enter as many depth-sound velocity pairs you choose, however when more than 512 layers are found, down sampling occurs, merging the layers with the most similar gradients.

NOTE: If, for some reason, you have figures in feet, but you need to enter meters (or vice versa), you can convert either value from feet to meters or meters to feet through the Convert menu.

3. Once your depths and correction values are entered**, click [Graph]** to display a graph the data on the right side of the window. (Optional)
4. **Save your spreadsheet data.** Select FILE-SAVE and name your file. The spreadsheet data will be saved to a sound velocity corrections file (*.VEL) in your project directory. You may re-open the spreadsheet for editing purposes at a later time by selecting FILE-OPEN and selecting the file.

IMPORTING SOUND VELOCITY DATA

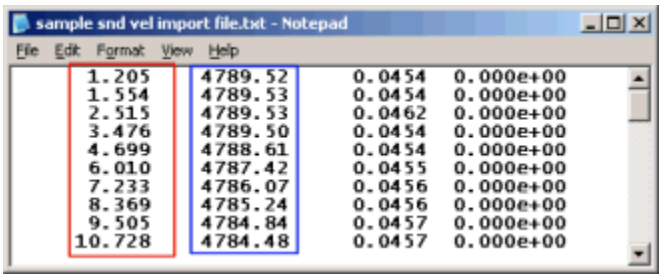
Many of you save the data from your sound velocity casts in a text document (or format that can be easily converted to a text document). You can quickly and easily import a text file to the SOUND VELOCITY program.

The file can be either space- or comma-delimited with each record on a different line. It is easiest if depth and sound velocity values are in the same position in each line.

The SOUND VELOCITY program limits the profile to 512 depth/sound velocity pairs.

NOTE: You may load more than 512 SV layers from text files or VEL files; however, when more than 512 layers are found, downsampling occurs, merging the layers with the most similar gradients.

FIGURE 4-2. *Sample Import File for the Sound Velocity Program*



1. **Select FILE-IMPORT** and a File Selection dialog will appear for you to select your text file. The Import dialog will appear with a display of the values from the first line in your text file.
2. **Check the Accept box next to the two fields that represent the depth and sound velocity correction values.** This tells the program which two values to read from the displayed record.
3. **Accept the data for your Sound Velocity Corrections file.**
   - **If your depth and correction values are always in the same position, as suggested, click [Accept All]** and the program will extract the selected fields from each line in the file.
   - **If the value position varies, click [Accept Record].** The program will copy only the displayed values to your Sound Velocity Corrections file, then display the values from the next line of the text file. This allows you to step through your text file, one line at a time, changing the position designations (select new checkboxes) before accepting each record or skipping lines all together ([Skip Record]). Continue through your file until you have all of the values in your corrections file that you need.

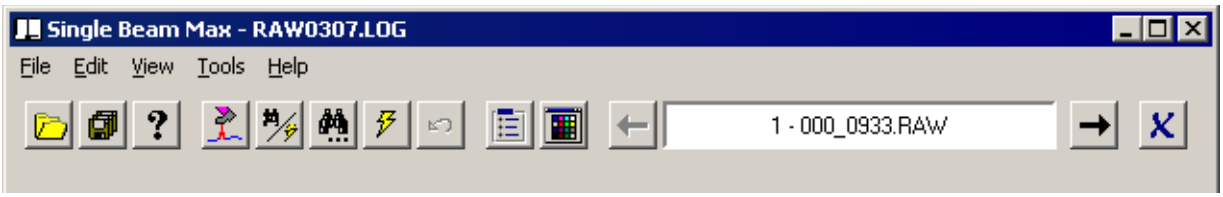
4. **Click [OK]** to return to the SOUND VELOCITY spreadsheet. The selected data will listed in the spreadsheet and graphed in the SOUND VELOCITY dialog.
5. **If the depths and correction values have been reversed in the spreadsheet, correct them by clicking [Swap Columns].**
6. **If your depths are not in chronological order, Sort your depths** by clicking [Sort].

SINGLE BEAM EDITOR

The SINGLE BEAM EDITOR reads raw or edited sounding files containing single beam or dual frequency survey data. It applies tide and sound velocity corrections to the soundings to find corrected depth or elevation.

The SINGLE BEAM EDITOR displays all measurements graphically and provides a number of editing methods. When editing is complete, the program saves the corrected and cleaned data in the HYPACK® proprietary ALL format for further work in the Sounding Selection and Final Product programs.

FIGURE 4-1. *The SINGLE BEAM EDITOR Shell*



The title bar of the SINGLE BEAM EDITOR shell displays the files you have loaded to the program.

Most procedures initiated from the many display windows are initiated with the click of an icon. If you are not sure which icon is referred to in the procedures of this manual, hold the cursor over each button and its name will appear.

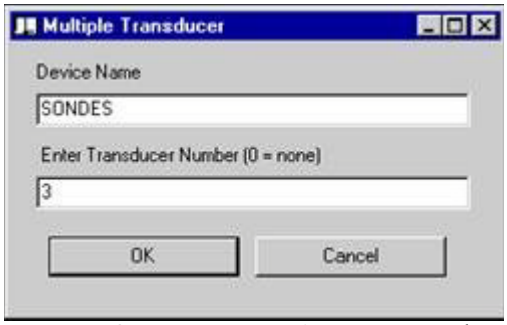
The file currently being displayed is shown in the field on the right. If you have loaded a catalog file, you can scroll through the files in the catalog by using the left and right arrows. Typically you would edit the first line then use the right arrow to move on to the next one.

SINGLE BEAM EDITOR PROCEDURE

1. **Set your geodetic parameters** in the Geodetic Parameters program. Typically they should match those of the survey.
2. If you have not applied tide corrections during SURVEY, or want to apply new tide corrections, **create a Tide Corrections file** using the MANUAL TIDES or HARMONIC TIDES program.
3. **If necessary, take a sound velocity cast and create a Sound Velocity file** in the SOUND VELOCITY program. You can skip this step if you have:
   - Logged sound velocity during your survey.
   - Set your echosounder to account for sound velocity before the survey.

4. **If you are using Seabed ID data, use the SeabedID device driver in your hardware configuration to assign seabed identification numbers to your data.** (This requires a Seabed ID Square from the SEABED STATISTICS program.) Once your data files are loaded to the SINGLE BEAM EDITOR, you can view your E1, E2 and seabed ID data in the Spreadsheet. The Survey and Profile windows can also display depth data color-coded according to the seabed ID.
5. **Open the SINGLE BEAM EDITOR** by selecting PROCESSING-SINGLE BEAM EDITOR or by clicking the icon.
6. **Select your Soundings file** by selecting FILE-OPEN (or using F2). You can select a Catalog file (*.LOG), which is a list of several data files, or a single data file. The SINGLE BEAM EDITOR can read either raw or edited soundings; it can not read XYZ data files.
   - **If you load multiple transducer data**, a dialog will appear for you to select the beam from which the SINGLE BEAM EDITOR should read.

FIGURE 4-2. *Choosing a Beam from Multiple Transducer Data*



   - **If you load multibeam data,** the program will read the nadir depth.

   The Corrections dialog will appear next.
7. **Enter your corrections**.
   - **If you are working with raw data and have not applied tide corrections during SURVEY**, select the Tide Corrections (*.TID) file which you want to applied to the data.
   - **If you are working with raw data and have not applied sound velocity corrections during your survey**, select the sound velocity corrections (*.VEL) file to which you want to apply the data.
8. **Set your read parameters.** This enables you to apply pre-filtering and perform other operations on the data as it is read into the editor.
9. **Examine and edit your data.**
   a. **Examine and edit the graphs** representing corrections and track lines.
   b. **Graphically examine the soundings**. Scroll through the survey lines by using the arrow buttons on the shell and making any

necessary corrections for each survey line until you have edited all of your data.

c. **Set your Search and Filter Options.** These criteria are used to search out cells with data outside of user-defined limits.

d. **Use the Search and Filter feature to find and evaluate any stray points.** You can evaluate each instance yourself and edit if you think it's necessary or instruct the SINGLE BEAM EDITOR to delete all points outside the limits.

10. **Save the final edited data.** FILE-SAVE will save the data in All format to a file with the same name in the project's edit directory.
11. **Exit the SINGLE BEAM EDITOR** by selecting FILE-EXIT.

More Information

- "Selecting Sounding Files in the Single Beam Editor" on page 4-10
- "Corrections in the Single Beam Editor" on page 4-11
- "Read Parameters in the Single Beam Editor" on page 4-20
- "Search and Filter Options in the Single Beam Editor" on page 4-42
- "Editing Data in the SINGLE BEAM EDITOR" on page 4-46
- "Saving Edited Single Beam Data" on page 4-51

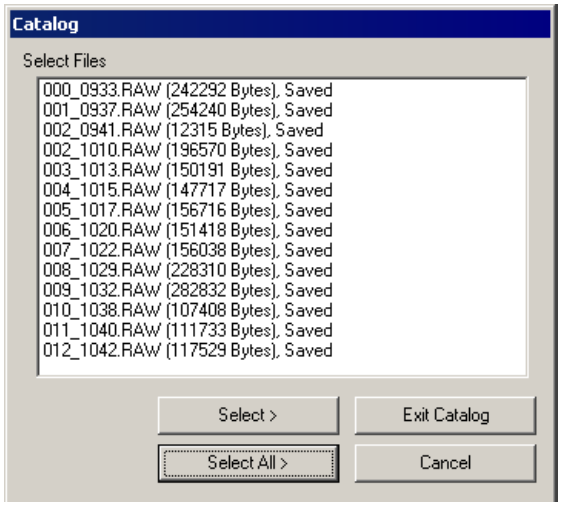
SELECTING SOUNDING FILES IN THE SINGLE BEAM EDITOR

Select FILE-OPEN to call up an open dialog. The default directory will be the project file. The SINGLE BEAM EDITOR works with multiple file formats. Single beam data can be read from any of the following:

- **HYPACK® Raw Data**: Single beam or multiple transducer files collected by the HYPACK® SURVEY program.
- **All Format files:** Files that have been saved by the SINGLE BEAM EDITOR may be reopened for further examination and editing.

You may select either individual files or a catalog file. A catalog file is a list of individual data files. If a catalog file is selected, the SINGLE BEAM EDITOR reads the file and provides you with a list of files in the catalog.

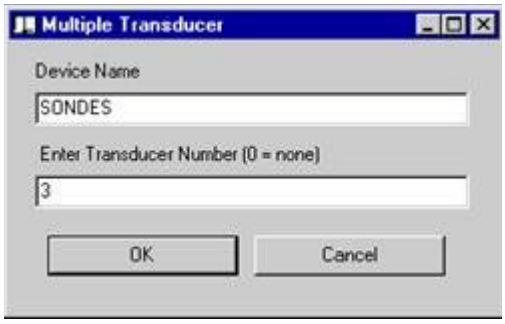
FIGURE 4-3. *Selecting Sounding Files in the SINGLE BEAM EDITOR*



You can include all of the line files by clicking [Select All] or you can include individual files by highlighting them and clicking [Select]. The SINGLE BEAM EDITOR will default to the next selected file in the list every time you scroll to the next line file number in the field on the SINGLE BEAM EDITOR toolbar. This list will also be used to track which files have been edited.

If you are loading multibeam data, a multibeam dialog will appear for you to select the beam from which the SINGLE BEAM EDITOR should read.

FIGURE 4-4. *Selecting Soundings from Multiple Transducer Data*



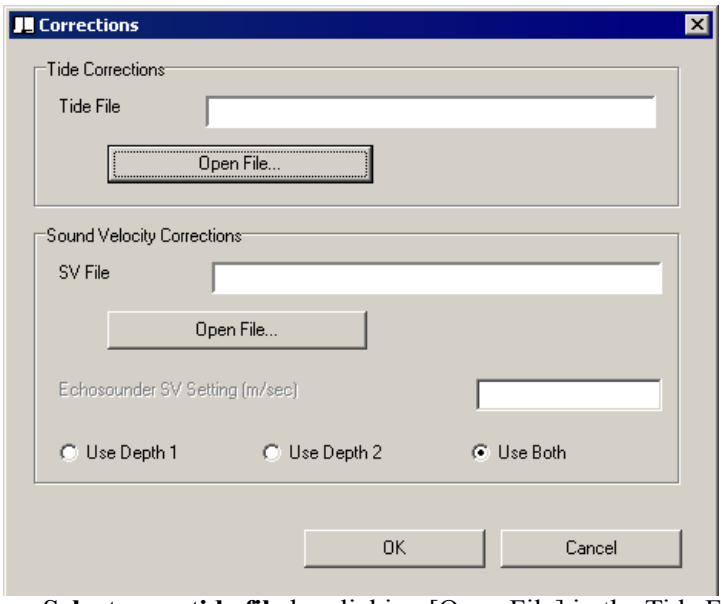
CORRECTIONS IN THE SINGLE BEAM EDITOR

The SINGLE BEAM EDITOR enables you to work in depths or elevations, applying Tide and Sound Velocity Corrections along the way.

Corrected Depth = Tide Correction + (Raw Depth + Transducer Depth Offset + Draft Correction)

Corrected Elevation = Tide Correction - (Raw Depth +Transducer Depth Offset + Draft Correction)

FIGURE 4-5. *Corrections Dialog*

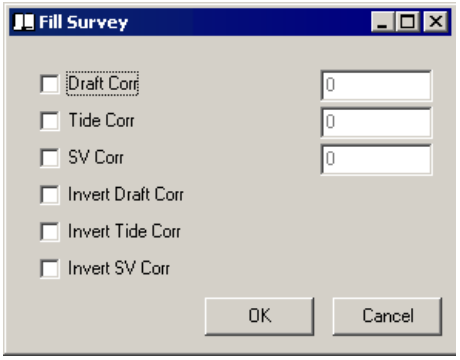


- **Select your tide file** by clicking [Open File] in the Tide File section and selecting the correct file from the file selection dialog.
- **Select your sound velocity file** in the same manner, clicking [Open File] in the Sound Velocity section.
- **Echosounder SV Setting** tells the SINGLE BEAM EDITOR what sound velocity setting the transducers were using while collecting data.

Tide, Sound Velocity, and Draft Correction values may be manually edited in the SINGLE BEAM EDITOR:

- **Individually** by typing a new value into the record.
- **From a specific point in the line to the end of the current file** (named in the SINGLE BEAM EDITOR shell). Select the tide value in the record at the starting point and enter the desired value if necessary. Click [Fill Column] to copy that value in each record to the end of the line.
- **Throughout the survey.** Select EDIT-FILL SURVEY and the Fill Survey dialog will appear.
  - **To change the value of one or more correction type**, check one or more correction type enter the desired value for each and click [OK]. The selected correction values will be changed in all of the files currently loaded to the SINGLE BEAM EDITOR.
  - **To invert the existing values of one or more correction type**, check its invert option and click [OK].

FIGURE 4-6. *Fill Survey Dialog*



More Information

- "Heave Window in the Single Beam Editor" on page 4-32
- "Tide Corrections in SURVEY" on page 3-63
- "Creating a Sound Velocity File in the SOUND VELOCITY Program" on page 4-4
- "Tide (Water Level) Corrections" on page 8-1

TIDE CORRECTIONS IN THE SINGLE BEAM EDITOR

Tide Corrections are usually read from Tide files (*.TID) created by the MANUAL TIDES or HARMONIC TIDES PREDICTION programs. They may also be read from Raw Survey files that have tide information in their headers.

APPLYING PREDICTED TIDES IN THE SINGLE BEAM EDITOR

If tide corrections were not recorded during your survey or you need to change your tide corrections, select a new tide file by clicking [Open File] under Tide Corrections and selecting the correct file from the file selection dialog.

The tide corrections data is saved for each sounding in the edited All format file, overriding any data that may appear in the header of the raw data.

Tide Corrections relate raw soundings to the chart (low water) datum. When creating a Tide file for depth mode, enter tide values as negative numbers. When creating a Tide file for elevation mode, enter tide values as positive numbers. Units are according to those selected under Geodesy (feet or meters).

INTERPOLATING TIDE CORRECTIONS FROM MULTIPLE TIDE GAUGES

The TIDE ADJUSTMENTS program interpolates tide correction values from multiple tide gauges. This tool is available in the SINGLE BEAM EDITOR and during the first phase of editing in the HYSWEEP® EDITOR to adjust the tide data of the edited output files. The program has two routines:

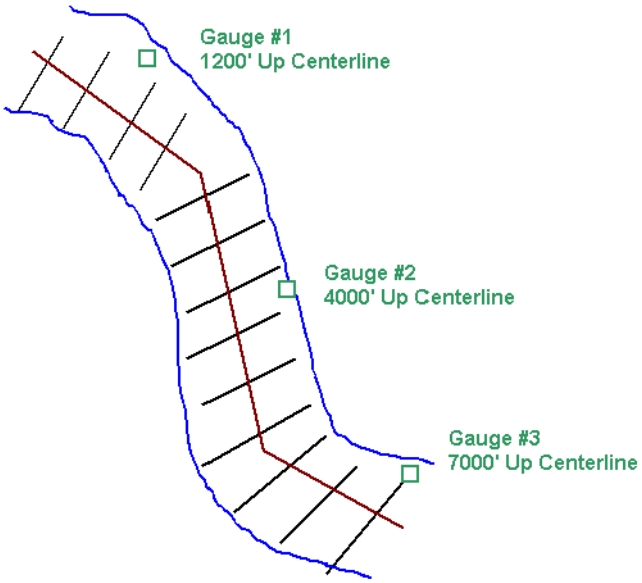
- The **center line method** for surveys where the tide gauges are in a line along a river or coastline. TIDE ADJUSTMENTS will

interpolate tide correction values, based on the distances along a line between gauges.

You will need:

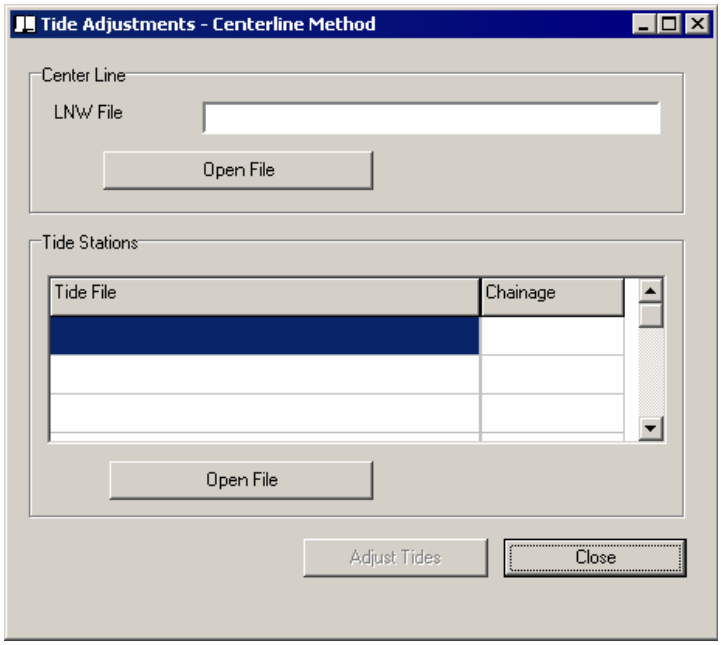
- A *.TID file for each gauge location
- The distance of each gauge along the center line.
- A *.LNW file that contains just the center line (limited to 1000 waypoints).
- The data files you wish to adjust.

FIGURE 4-7. *River with 3 Tide Gauges and a Center Line LNW File*



a. **Start the program by selecting TOOLS–TIDE ADJUSTMENTS-CENTER LINE METHOD.** The Tide Adjust dialog will appear.

FIGURE 4-8. Tide Adjust Dialog



b. **Enter the name of the *.LNW file that has your center line (and nothing else).** Click [Open File] below the LNW File field and select the file name from the File Select dialog.

c. **Enter the names of the *.TID files.** For each Tide file, place your cursor in the first available cell in the table, click [Open File] under Tide Stations and select the Tide file from the file selection dialog.

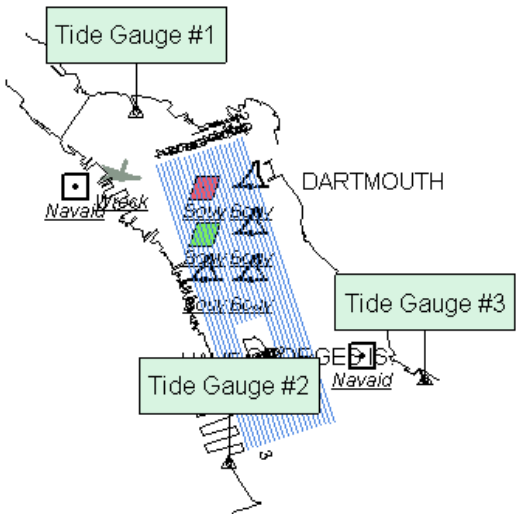
d. **Enter the Chainage** (and their distances along the center line) for each Tide File.

e. **Correct the soundings by clicking [Adjust Tides].** The program will assign tide correction values only to the edited files. It does not change the raw files.

- The **three point method** for survey areas with 3 tide gauges around the area. The program creates a triangular tidal surface between the three stations to generate a correction at the vessel position.

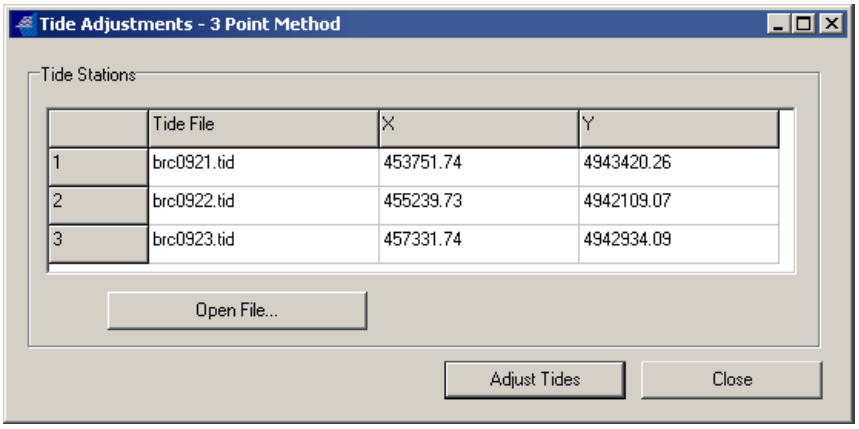
NOTE: For best results, your survey area lie within the triangular area defined by the three tide stations.

FIGURE 4-9. *Tide Adjustments - 3 Point Method*



a. **Start the program by selecting TOOLS–TIDE ADJUSTMENTS-3 POINT METHOD.** The Tide Adjustments dialog will appear.

FIGURE 4-10. *Tide Adjustments Dialog*



b. **Enter the names of the *.TID files.** For each Tide file, place your cursor in the first available cell in the table, click [Open File]and select the Tide file from the file selection dialog.

c. **Enter the position of each tide gauge** for each Tide File.

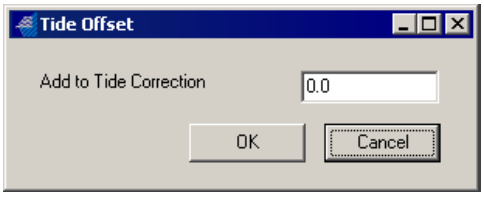
d. **Correct the soundings by clicking [Adjust Tides].** The program will assign tide correction values only to the edited files. It does not change the raw files.

OFFSETTING TIDE CORRECTIONS

If, once you load your tide corrections, you discover that they are all off by a constant amount, this tool enables you to shift each tide correction by the same user-defined amount.

1. **Select TOOLS-TIDE ADJUSTMENTS-TIDE OFFSET.** The Tide Offset dialog will appear.

FIGURE 4-11. Tide Offset Dialog



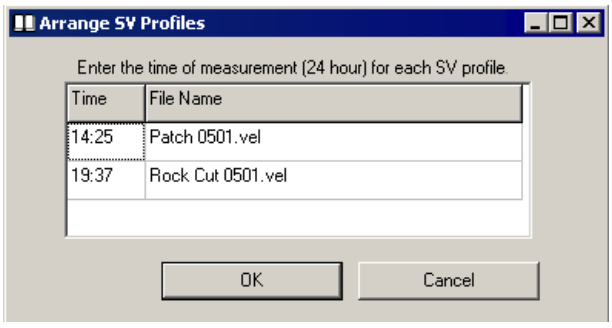
2. **Enter the amount, in survey units, that you need to adjust the tide corrections.** This value will be added to the current tide correction for each sounding so, if you need to decrease the tide correction, enter a negative number.
3. **Click [OK].** The graph in the Tide and Draft Corrections window will update automatically. In the Spreadsheet window, click the [Refresh] button to display the updated tide values.

SOUND VELOCITY CORRECTIONS IN THE SINGLE BEAM EDITOR

If you are editing raw data:

1. **Select your Sound Velocity Corrections file** by clicking [Open File] under Sound Velocity Corrections and choosing one or more VEL files from the file selection dialog.
   - **Where sound velocity profiles are constant**, enter one VEL file.
   - **Where your sound velocity profiles are likely to change**, you can enter up to 48 sound velocity profiles and the time of each cast. The editor interpolates the sound velocity correction value based on the times in the VEL files and the time-tag of your soundings.
     i. **In the File Select dialog, hold the Ctrl key and select the VEL files** for your survey then click [Open]. The selected VEL files will be listed in a dialog with their creation times.

FIGURE 4-12. Loading Multiple Sound Velocity Files



     ii. **Edit the times to match the times of the sound velocity casts**, if necessary, and click [OK].

IMPORTANT! The corrections are assigned based on time so you should edit your data one day at a time.

2. **Enter the Echosounder SV Setting (m/sec) according to the setting on your echosounder during the survey**.
3. **Select the depth at which to base the correction**.
   - **Depth 1 and Depth 2** tells the editor to read that depth, match it to the corresponding correction from the Sound Velocity Corrections file and correct both depths with that corrections value.
   - **Both** uses the deeper of the two values.

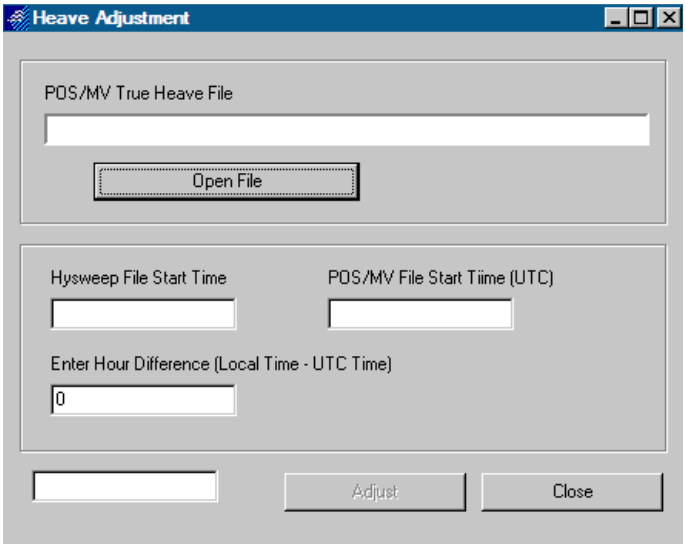
Sound Velocity Corrections are read from files created in the Sound Velocity program (*.VEL) described earlier in this section and stored for each sounding in a sound corrections field in the edited All format file. No Sound Velocity corrections will be applied where depth equals 0.

TRUE HEAVE CORRECTIONS ON THE SINGLE BEAM EDITOR

If you have logged POS/MV Group 111 data or F180 CSV data during survey, the editor programs include a specialized routine that applies that true heave data to your sounding data.

1. **Select TOOLS-HEAVE ADJUSTMENT** and the type of true heave data you have collected. The Heave Adjustment dialog will appear.

FIGURE 4-13. *Heave Adjustment Dialog*



2. **Click [Open File] and select your true heave file.** The start times from both your single beam file and your true heave are displayed.
3. **Calculate the time difference** between the two start times and enter it under ‘Enter Hour Difference’.
4. **Click [Adjust]** to apply the delayed heave. All soundings are now corrected with the true heave values.

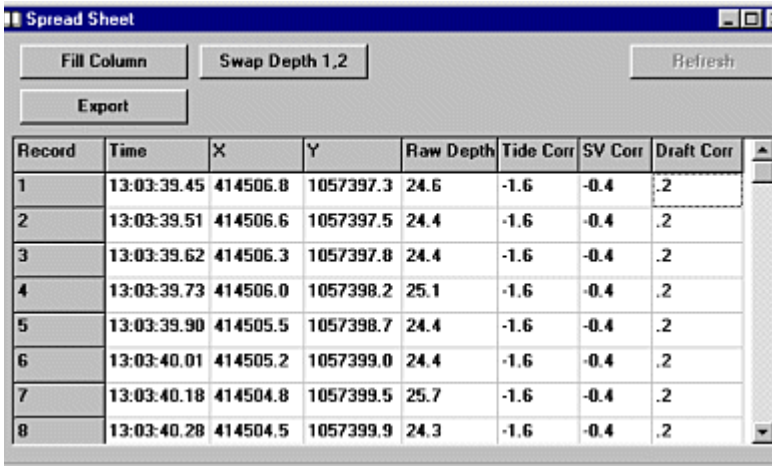
More Information

- "Interfacing the POS MV with HYPACK®" on page 2-211
- "Delayed Heave Processing" on page 2-216
- "Heave Window in the Single Beam Editor" on page 4-32

MERGING CORRECTIONS IN THE SINGLE BEAM EDITOR

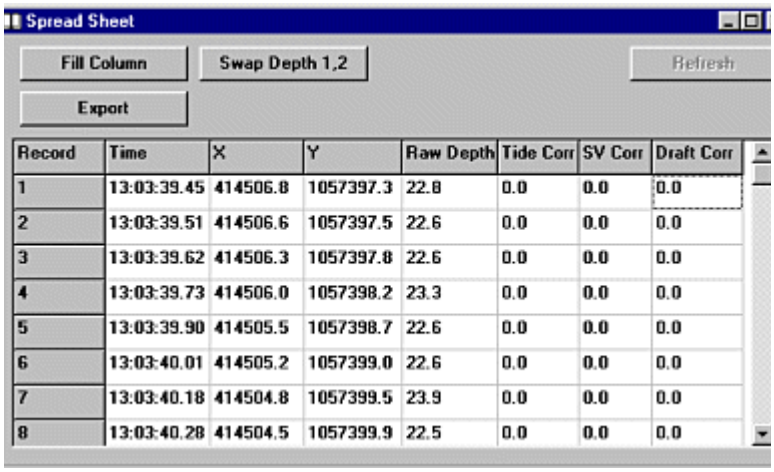
This feature adds the tide, draft and sound velocity correction to the raw sounding. It then resets all corrections to zero. Just select EDIT-MERGE CORRECTIONS, confirm that you're sure and the SINGLE BEAM EDITOR will do the rest. The effect of this process can be easily viewed in the spreadsheet.

FIGURE 4-14. *Depths and Corrections displayed separately before the merge process*



Record	Time	X	Y	Raw Depth	Tide Corr	SV Corr	Draft Corr
1	13:03:39.45	414506.8	1057397.3	24.6	-1.6	-0.4	.2
2	13:03:39.51	414506.6	1057397.5	24.4	-1.6	-0.4	.2
3	13:03:39.62	414506.3	1057397.8	24.4	-1.6	-0.4	.2
4	13:03:39.73	414506.0	1057398.2	25.1	-1.6	-0.4	.2
5	13:03:39.90	414505.5	1057398.7	24.4	-1.6	-0.4	.2
6	13:03:40.01	414505.2	1057399.0	24.4	-1.6	-0.4	.2
7	13:03:40.18	414504.8	1057399.5	25.7	-1.6	-0.4	.2
8	13:03:40.28	414504.5	1057399.9	24.3	-1.6	-0.4	.2

FIGURE 4-15. *After the merge*



Record	Time	X	Y	Raw Depth	Tide Corr	SV Corr	Draft Corr
1	13:03:39.45	414506.8	1057397.3	22.8	0.0	0.0	0.0
2	13:03:39.51	414506.6	1057397.5	22.6	0.0	0.0	0.0
3	13:03:39.62	414506.3	1057397.8	22.6	0.0	0.0	0.0
4	13:03:39.73	414506.0	1057398.2	23.3	0.0	0.0	0.0
5	13:03:39.90	414505.5	1057398.7	22.6	0.0	0.0	0.0
6	13:03:40.01	414505.2	1057399.0	22.6	0.0	0.0	0.0
7	13:03:40.18	414504.8	1057399.5	23.9	0.0	0.0	0.0
8	13:03:40.28	414504.5	1057399.9	22.5	0.0	0.0	0.0

READ PARAMETERS IN THE SINGLE BEAM EDITOR

SELECTIONS TAB IN THE SINGLE BEAM EDITOR READ PARAMETERS

In the Selections Tab, select the devices to use for each type of data.

FIGURE 4-16. *SINGLE BEAM EDITOR Read Parameters--Selections Tab*

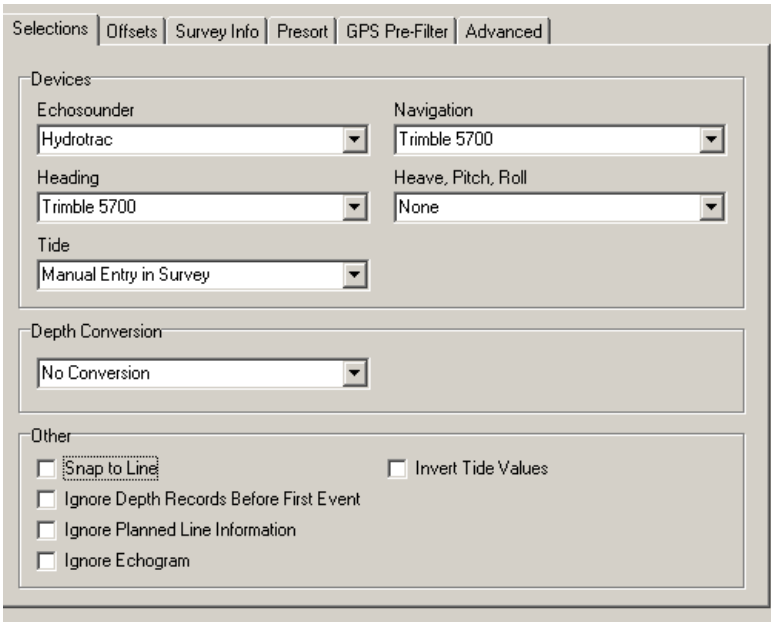
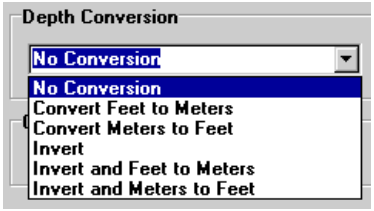


FIGURE 4-17. *Depth Conversion Options*



Depth Conversion options enable you to convert depths from feet to meters or from meters to feet. It also enables you to invert the depths. This facilitates converting your data from depth to elevation data.

To convert your data to elevation mode select DEPTH CONVERSION-INVERT. The depth values become negative. For example, a depth of "17.2" will appear as "-17.2" in the spreadsheet. You can add the tide correction and the program will add the two values to determine the depth.

The **Snap to Line** option takes all of your soundings and moves them perpendicular until they fall right on the planned survey line. This is a dangerous option.

Ignore Depth Records Before First Event saves sounding data only after the first event occurs in each line.

Ignore Planned Line Information: Check this if you have planned lines that do not correspond well with the survey data. It is also helpful when there is a large position spike with a multi-segmented planned line, which can be difficult to edit.

Check Invert Tide Values box when you are working in elevation mode and using RTK tide corrections.

OFFSETS TAB IN THE SINGLE BEAM EDITOR READ PARAMETERS

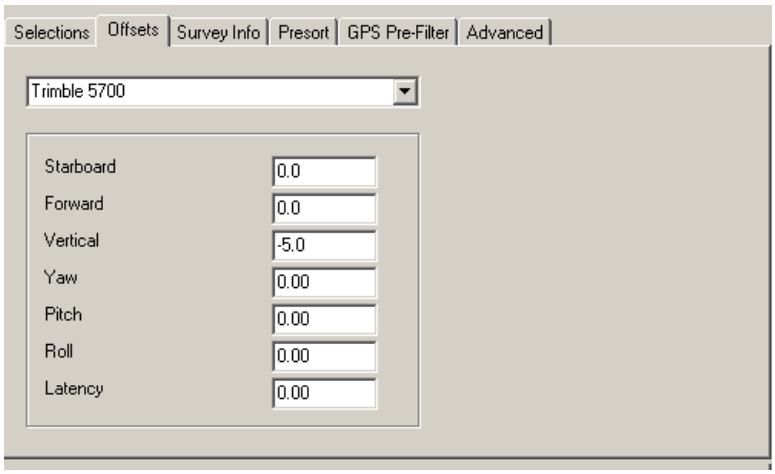
The Offsets tab displays the offset settings for each device in your project. Select the device of interest from the drop down box and view or modify the offsets.

The offsets are displayed as they were configured during your survey. If they are incorrect, enter them *as they should have been* during survey.

Any changes you make here will be applied to all currently selected files.

NOTE: Editing the offsets will affect only the edited data. It will not affect raw data.

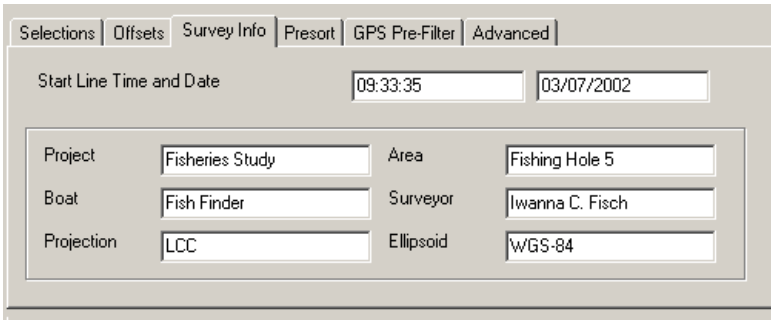
FIGURE 4-18. *SINGLE BEAM EDITOR Read Parameters—Offsets Tab*



SURVEY INFORMATION TAB IN THE SINGLE BEAM EDITOR READ PARAMETERS

The Survey Information tab displays some basic project information entered during SURVEY.

FIGURE 4-19. *Read Parameters—Survey Information Tab*

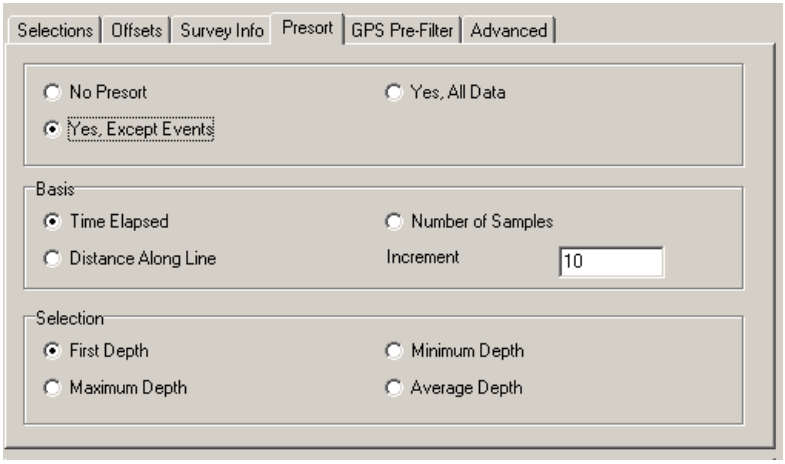


PRESORT TAB IN THE SINGLE BEAM EDITOR READ PARAMETERS

The Presort option is a way of reducing the amount of data you have to edit in the EDITOR program.

Its use is not recommended, as we feel there are better ways of thinning your data later on in the program

FIGURE 4-20. *Read Parameters—Presort Tab*



In the top section, you can elect to window all of the data or any points that are not event marks (or to omit presort at all). Some users wish to read the event marks to maintain the integrity of the track line If a point with an event mark is removed, the event mark will be moved to the next point when you plot track lines.

If you select either “Yes” option, the Presort options are enabled.

Presort divides your survey data into “blocks”. Blocks can be based on the Time Elapsed, the Number of Samples (depths) or the Distance Along Line.

Increments are determined by the above choices you have made.

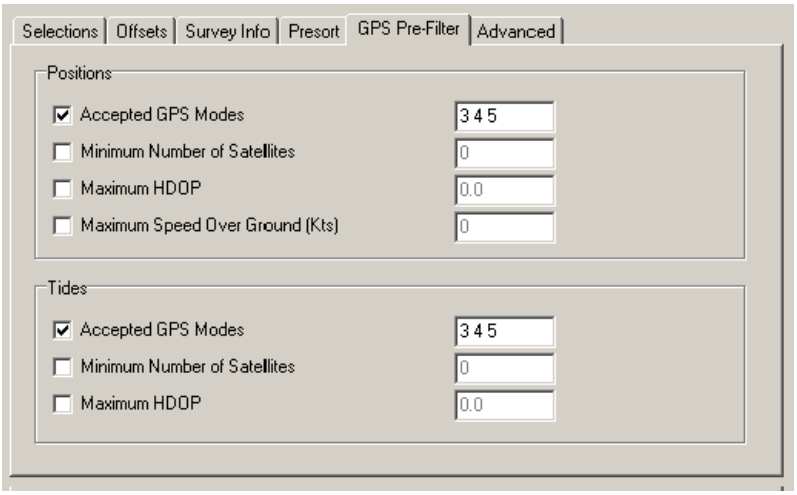
Basis Selected	Increments
Time Elapsed	Seconds
Number of Samples	Number of depths
Distance Along Line	Feet or Meters

Once Presort has divided your data into blocks, it will only bring one depth from each block into the editor spreadsheet. This depth can be the **First Depth**, the **Minimum Depth**, the **Maximum Depth**, or the **Average Depth** in each block. If you choose the Average Depth option, the depth is positioned at the center of the block. For each of the other choices, the point is positioned at its original location.

GPS Pre-Filter Settings in the SINGLE BEAM EDITOR

The GPS Pre-filter Tab options enable you to omit position and RTK tide data as it is read into the SINGLE BEAM EDITOR. Any data that does not meet the criteria set in this tab will be edited out for you before anything is displayed in the data windows.

FIGURE 4-21. *GPS Pre-Filter*



Accepted GPS Modes: List GPS modes for which you want to read data. If the GPS mode does not match any of the specified values, the POS or TID record will be omitted from being read into the editor. Values may be separated by commas or spaces.

Minimum Number of Satellites: If the number of satellites recorded in the quality information is less than the user-specified number, the POS or TID record will be omitted from being read into the editor.

Maximum HDOP: If the HDOP recorded in the quality information is more than the user-specified number, the POS or TID record will be omitted from being read into the editor.

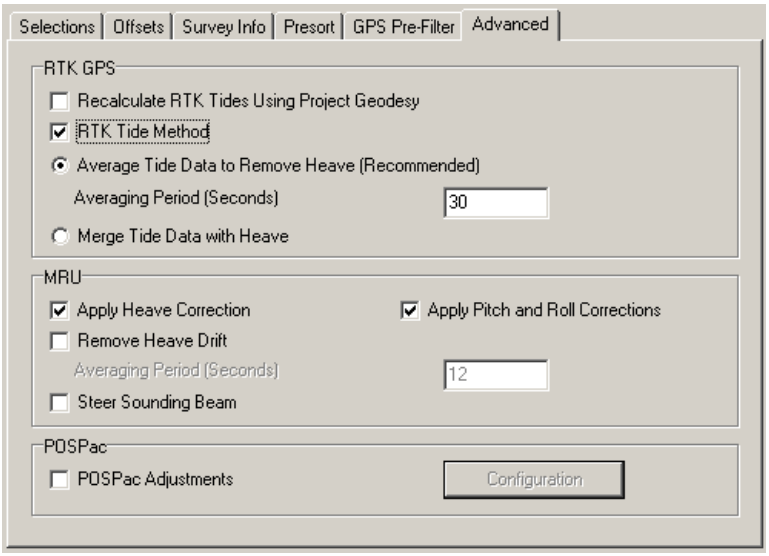
Maximum Speed over Ground (Kts): If the speed calculated ((pos2-pos1)/time) is more than the user-specified speed, the POS record will be omitted from being read into the editor.

RTK AND MRU SETTINGS IN THE SINGLE BEAM EDITOR

The Advanced Tab provides an opportunity to set preferences for RTK Water Level processing and Motion Reference Unit (MRU) options.

We recommend that you use neither or both RTK and MRU settings. If you have a Motion Sensor, apply the corrections to your data then, since you are applying corrections for heave, remove the heave from your tide data by selecting one of the RTK options.

FIGURE 4-22. *Advanced Tab*



RTK TIDES IN THE SINGLE BEAM EDITOR

Adjusting the RTK Tides for Heave

The RTK Tides check box tells the program you want to calculate water level corrections using RTK GPS elevation. If this option is selected, the two items below it become active to specify the basis for the calculation. For RTK Tides to accurately determine water levels, you must have made a Kinematic Tide Data (*.KTD) file and used the GPS.dll device driver. All measurements between RTK antenna and echosounder transducer must be precise and you must have heave-pitch-roll data. *You should not include the draft correction in the echosounder, as it does not factor into the calculation*.

- The **Average Tide Data to Remove Heave** method averages the RTK elevations over a user-specified Average Period to determine the

normalized heave plane. It then uses the heave information from the motion reference unit to determine the position of the RTK antenna.

- **The Merge Tide Data with Heave** method uses the RTK elevation as the starting point. It then uses the heave data received to determine the antenna height, until the next RTK elevation is received.

Both methods give similar results. The first method seems to be preferable, particularly if your survey boat is in rough waters.

Recalculating RTK Tides from the RAW Messages

Often users collect RTK (Real Time Kinematic) data then discover that their configuration was not quite correct. Some errors result in inaccurate RTK tide calculations in your raw data:

- Incorrect geoid model (if you are using one) or orthometric height correction in your geodesy settings.
- Incorrect KTD (Kinematic Tide Datum) information.
- Hardware configuration excludes the Tide function for the GPS.

Without this feature, surveyors who collected data with such errors would be forced to resurvey the area after correcting their project configuration.

This tool enables you to recalculate the RTK tide value in the editor program based on the current geodesy settings; the currently enabled KTD file in your project; and the RAW messages in your raw data files.

To successfully recalculate your RTK tides in the SINGLE BEAM EDITOR**:**

1. **Verify that your current geodesy settings** are correct.
2. **Verify that your KTD file is correct and enabled** in your project.
3. **Load your raw data to the SINGLE BEAM EDITOR, making sure to check the 'Recalculate RTK Tides using Project Geodesy' option**.

The SINGLE BEAM EDITOR ignores the TID records in your data set, recalculating each correction based on the raw messages, your current geodesy and KTD file. It then corrects for heave according to your selections.

MRU (Motion Reference Unit) Settings in the Single Beam Editor

The MRU options let you specify how the heave-pitch-roll information from a motion reference unit (MRU) will be applied.

- **Apply Heave Correction** determines a heave correction for every sounding.
- **Apply Pitch and Roll Corrections** is used to offset the position of the transducer from the navigation antenna.
- **Remove Heave Drift** corrects heave values that have drifted off-center due to rapid accelerations or changes of direction. Check the option and enter a value of seconds over which the heave should be averaged. Start with the time it takes to complete three full heave cycles.
- **Steer Sounding Beam** computes the X-Y coordinate for the point where the center of the transducer cone hits the bottom, based on the

pitch and roll data (rather than directly below the transducer) then calculates the corresponding depth. Normally you will not need this option, but it can be helpful where you have a narrow sounding beam and significant pitch and roll.

Adjusting Survey Data with POSPac Data

If you are using the Applanix POS MV with POSPac for positioning and as your motion sensor, you can improve the accuracy of your survey data.

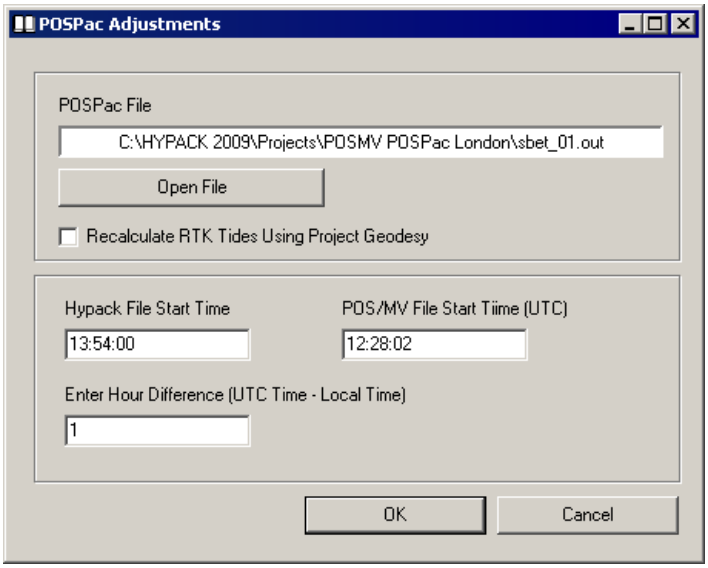
The POSPac Adjustments routine in the editor program uses the POSPac file (*.OUT or SBET file) to recalculate the following values:

- GPS Latitude, Longitude and elevation
- Pitch
- Roll
- Heading
- Tide (optional)

Since the data in the POSPac file is quite accurate and post-processing calculations can be better than those done in real-time, this routine typically improves the accuracy of your survey data.

1. **Load your raw survey data to the SINGLE BEAM EDITOR**.
2. **In the Advanced tab of the Read Parameters dialog, select 'POSPac Adjustments' and click [Configuration]**. The POSPac Adjustments dialog will appear.

FIGURE 4-23. POSPac *Adjustments Dialog*



3. **Enter the adjustment parameters**.
   - **POSPac file** (*.out) logged with your survey data.
   - **HYPACK® File Start Time** and **PosMV Start Time** update automatically according to the information in the files themselves.
   - **Hour Difference** is the difference between the POSPac UTC time and Local Time setting *on the Survey Computer*.

- **Recalculate RTK Tides Using Project Geodesy**: Check this option if you want to recalculate your tide corrections with all of the other calculation adjustments.

4. **Click [OK].** A series of numbers will be displayed at the lower left and the cursor shows the hourglass to indicate the calculations are in progress.
5. **When the calculations are finished, click [Close]** to return to the SINGLE BEAM EDITOR.

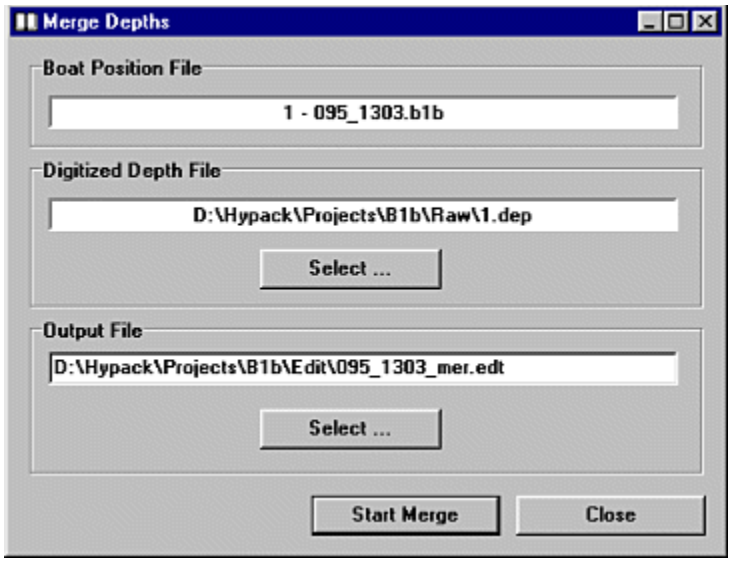
MERGING DIGITIZED DEPTH DATA WITH RAW SURVEY DATA

In areas of "fluff" or "Liquid mud", it is sometimes necessary to hand digitize the sounding data to a separate file (in the ECHOGRAM program) then merge these files with the raw sounding data.

To merge digitized data with the raw data:

1. **Select FILE-MERGE DEPTHS**. The Merge depth dialog will appear.

FIGURE 4-24. *Merge Depths Dialog*



2. **Enter the name of the Digitized Depth file** (*.DEP) by clicking [Select…] and selecting it from the file selection dialog.
3. **Enter the name for the output file** by clicking [Select….] and entering it in the file selection dialog. You will use this file in the SINGLE BEAM EDITOR to assign correction data, and examine and edit your data.
4. **Click [Start Merge]** and the SINGLE BEAM EDITOR will match the event marks in each file and merge the sounding data from the

*.DEP file to the data file. The merged files will be saved by default to the Edit directory with an EDT extension.

WINDOWS IN THE SINGLE BEAM EDITOR

The SINGLE BEAM EDITOR is composed of a shell, five editing windows the Sound Velocity Profile window and the Pitch, Roll and Heading window.

Right click on any window to display a pop up menu of all applicable options (ie. display options, search and filter options, color options) for that window. The display options and color dialog may also be accessed through the icons in the the SINGLE BEAM EDITOR window.

You may edit data in any of the editing windows and the data will be automatically updated in the other windows.

NOTE: The Auto Refresh option must be checked in the Spreadsheet display options to keep the Spreadsheet in synch with the other windows. Otherwise, you must update it as needed using [Refresh] in the window.

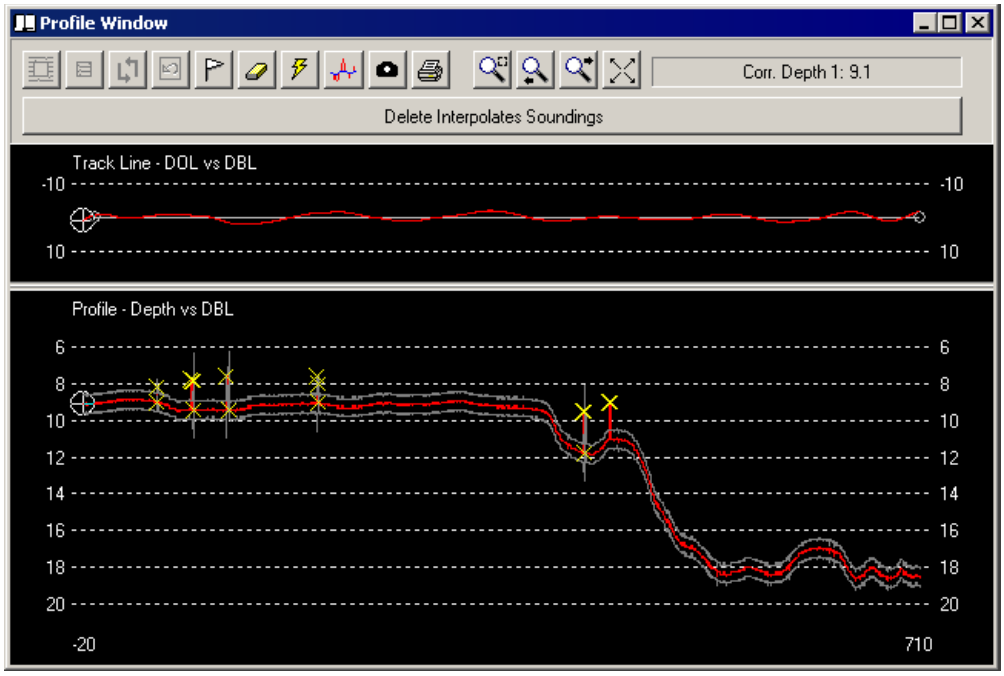
If, at any time, you delete position, heave, tide or draft data, the program interpolates the data. Soundings will only be removed if data is removed at either end of the survey line, rendering interpolation impossible.

If Sounding data is deleted, the data will be interpolated or removed according to the status of the button beneath the icons in that window which toggles between the two choices.

PROFILE WINDOW IN THE SINGLE BEAM EDITOR

The Profile window is composed of two graphical representations of your survey data, one line at a time. A detailed description of the Profile Window Display Settings are found in the following section.

FIGURE 4-25. Profile Window



Track Line shows the survey track line superimposed on the Planned Survey Line.

Profile shows the Depth Profile data. If the planned survey line contains template information, you will see it displayed.

- **In depth vs DBL mode** (set in the Display Options), the depth data is always displayed so the line origin is on the left-hand side of the screen, regardless of which direction the planned line was surveyed.
- **In depth vs time mode**, the earliest sounding is always on the left.

This is the window where bad soundings can be viewed and edited out. When a sounding is deleted, the data may be deleted or interpolated. This option is determined by the button below the icon bar. The selected option is displayed on the button. Choose the other option by clicking the button. (The label will change to confirm your choice).

In the Profile window, you can delete data from both frequencies or delete data from one frequency and still retain the data in the other. The interpolation option continues to interpolate values for both frequencies.

You can view data that has been deleted, marked with a red "X" by selecting the **Show Deleted Points** option in the View Options.

To take a screenshot of the profile, click the camera icon and name the file. Your screenshot will be saved in JPG format, by default to the project directory.

More Information

"Profile Window Display Settings in the Single Beam Editor" on page 4-36

SURVEY WINDOW IN THE SINGLE BEAM EDITOR

The Survey Window shows the survey track lines and event marks. The line shown in red indicates that which is represented in the Spreadsheet and Profile windows.

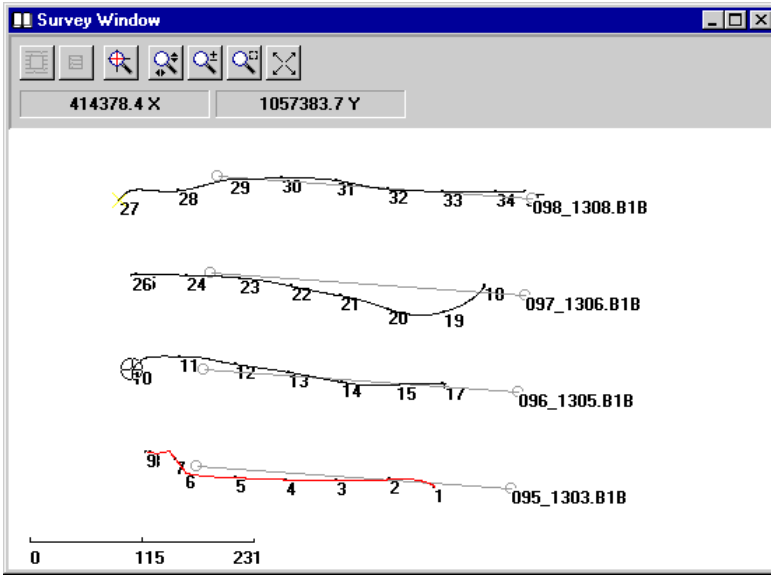
In the Survey Window Tab of the Display Options dialog, you can enhance the display with:

- soundings
- planned lines
- background charts

To measure the distance and azimuth between two points, drag the cursor from one point to the other. The measurements are displayed in the status bar.

NOTE: Though soundings are displayed in the Survey Window, you can only edit position (track lines) in this window. Soundings must be edited in the Profile Window.

FIGURE 4-26. *Survey Window*



More Information

"Survey Window Display Settings in the Single Beam Editor" on page 4-39

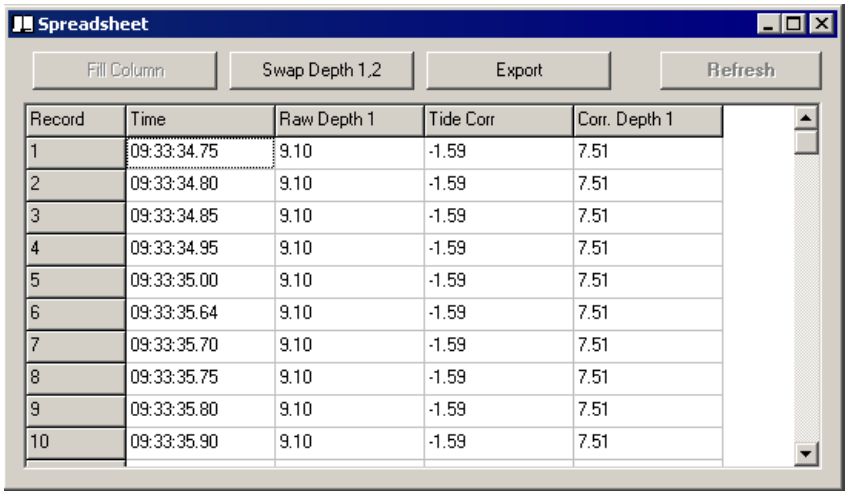
SPREADSHEET WINDOW IN THE SINGLE BEAM EDITOR

The Spreadsheet provides the data for every survey record. If data has been deleted, the corresponding cell in the spreadsheet will display "xxxxx" in place of the deleted depth reading.

The Auto Refresh option in the Spreadsheet Display Options, keeps the Spreadsheet data synchronized with the other windows. You can manually edit the values in the spreadsheet and the other windows will update accordingly.

If the Auto Refresh option is not selected, you will need to update it, as needed, using [Refresh].

FIGURE 4-27. *The Spreadsheet*



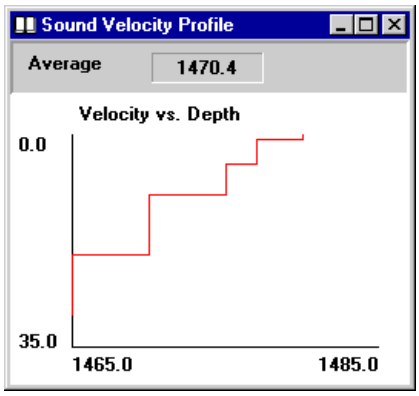
More Information

"Spreadsheet Window Display Settings in the Single Beam Editor" on page 4-40

SOUND VELOCITY CORRECTIONS WINDOW IN THE SINGLE BEAM EDITOR

The Sound Velocity Profile shows a graph of the data from your Sound Velocity Corrections file. It plots the velocity correction against depth.

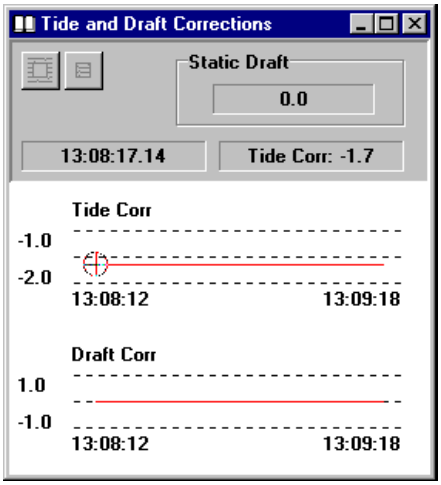
FIGURE 4-28. *A Sample Sound Velocity ProfileA Sample Sound Velocity*



TIDE AND DRAFT CORRECTIONS WINDOW IN THE SINGLE BEAM EDITOR

The Tide and Draft Corrections window graphs show the tide and Draft Correction values over time. You can block edit the graphs by dragging a block and clicking the button to delete inside or outside of the box. The program will interpolate the data to "fill the gap". If the beginning of the line is deleted, interpolation is not possible and soundings will be removed.

FIGURE 4-29. *Tide and Draft Corrections Window*

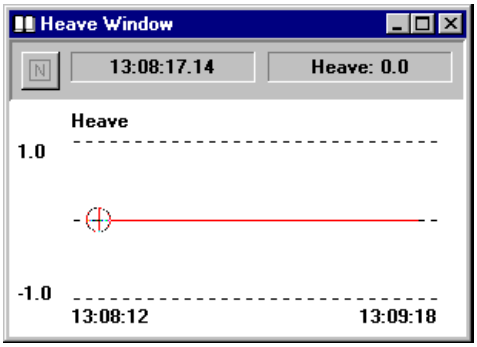


HEAVE WINDOW IN THE SINGLE BEAM EDITOR

The Heave Window graphs the heave correction over time. You can drag a block around any portion of the graph and define a new value by clicking [N] in the corner of the dialog. Typically, if you have a stretch of bad heave, you would replace it with zero since, theoretically, heave

averages out to zero. (This really helps after those speedy turns from the end of one line to the beginning of the next!)

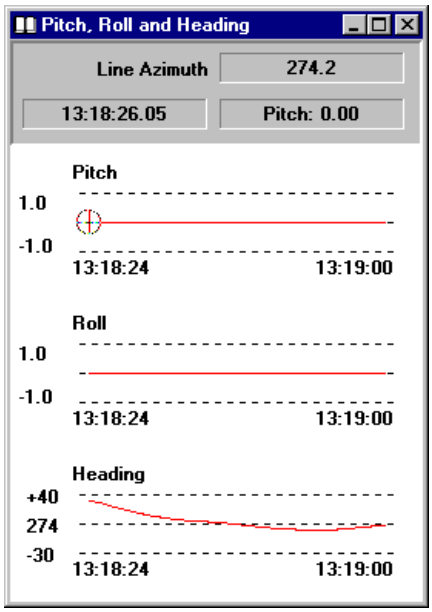
FIGURE 4-30. *The Heave Window*



PITCH ROLL AND HEADING WINDOW IN THE SINGLE BEAM EDITOR

The Pitch, Roll and Heading Window graphs heave, pitch and heading over time. These graphs are not editable.

FIGURE 4-31. *The Pitch Roll and Heading Window*



ECHOGRAM WINDOW IN THE SINGLE BEAM EDITOR

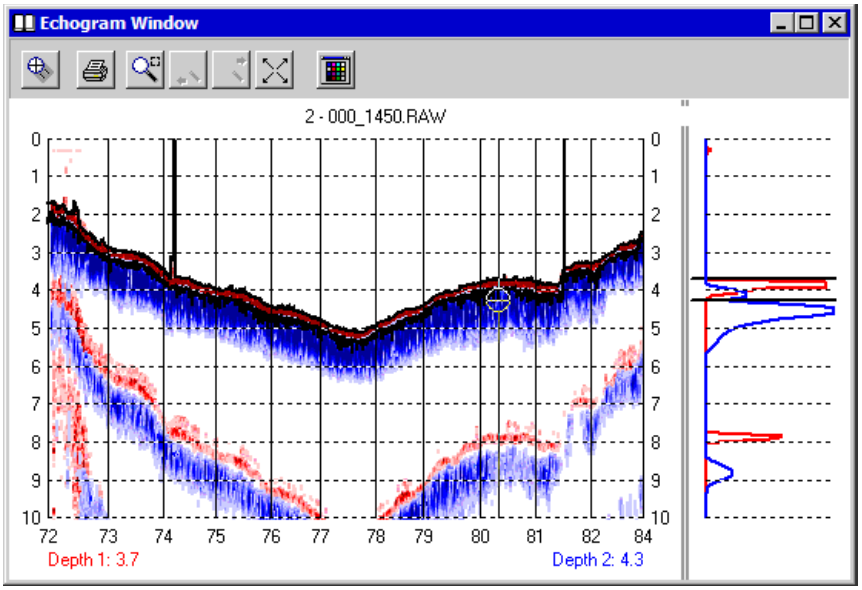
The Echogram Window provides an editable graphical display of Odom MKIII analog data. It displays high frequency (red) and low frequency (blue) depth data in a graph (left) and the return strength information corresponding to the current cursor position. The window synchronizes

with the other window displays, providing you with additional information and tools with which you may edit your data.

The depths displayed are the same as in the Profile window.

An alternate color scheme, best for EA400 data and familiar to Kongsberg users, is available by toggling the 'Toggle Color Scheme' icon.

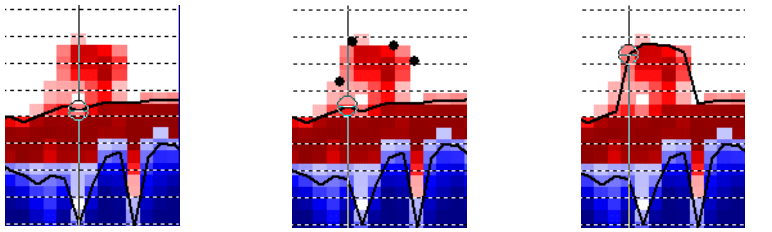
FIGURE 4-32. *Echogram Window*



There are two methods to edit data in the Echogram window.

- **Use the digitizing tool** to mark new depths.
  a. **Select the frequency** that you want to edit by selecting a depth on its path.
  b. **Click the Digitizing Tool icon**. It will appear depressed and the cursor will become a crosshair cursor.
  c. **Use the cursor to mark at least 2 new points** in the graph.
  d. **Click the Digitizing Tool icon again**. The depths of that frequency in the marked range will be updated according to your marks, interpolating the intervening depths.

FIGURE 4-33. *Digitizing New Depths in the Echogram*

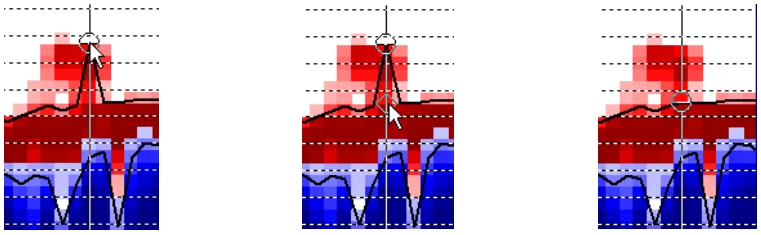


Select Frequency *Digitize New Depths* *Resulting Depths*

- **Drag and drop individual depths** with the cursor.

a. **Click on the sounding that you want to relocate**. A Circular symbol marks the selected point.
b. **Hold the left mouse button down**. A diamond marks the current cursor position.
c. **Drag the diamond to the new location and release the mouse button**. The diamond shape will disappear and the point will be drawn at the indicated location.

FIGURE 4-34. *Drag and Drop Depths*



Select Depth *Drag Depth* *Resulting Graph*

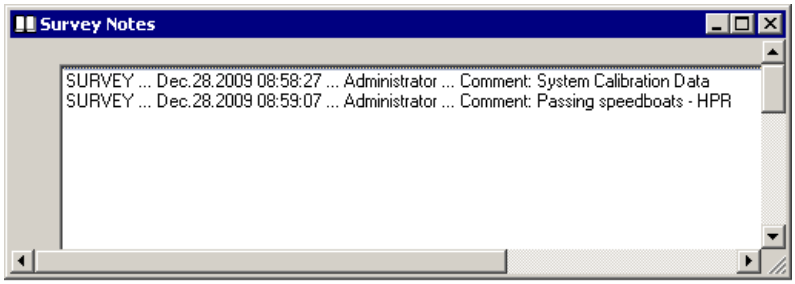
COMMENTS WINDOW

If you have recorded comments during SURVEY, you can display them and refer to them as you edit your data.

To view your comments log:

1. Load your survey data to the editor.
2. Select FILE - SHOW SURVEY NOTES. A separate window will display the comments logged in SURVEY.

FIGURE 4-35. *Sample Comments Display*

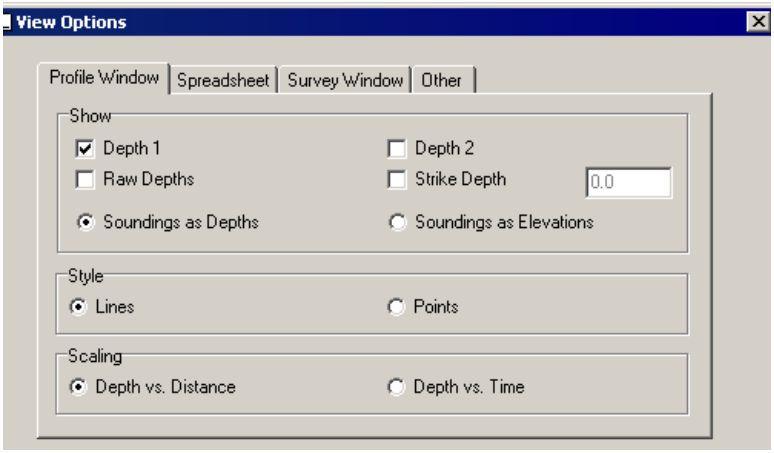


DISPLAY SETTINGS IN THE SINGLE BEAM EDITOR

PROFILE WINDOW DISPLAY SETTINGS IN THE SINGLE BEAM EDITOR

The Profile Window tab of the View Options dialog (F9) controls the Profile window display.

FIGURE 4-36. *View Options--Profile Tab*



- The **Depth 1** (red), **Depth 2** (blue), **Raw Depth** (gray) and **Strike Depth** (pink) check boxes are used to specify which elements you want displayed in the Profile window.
- **Soundings as Depths** displays larger soundings toward the bottom of the graph. Soundings as Elevations inverts the graph (not the sounding values) so that the larger soundings are toward the top.
- **Strike Depth** is used to place a reference line at the user-specified depth.
- **Style:** Choose whether to draw the points connected by a line or the individual data points.
- **Scaling:** Choose whether to view your data relative to time or distance traveled.

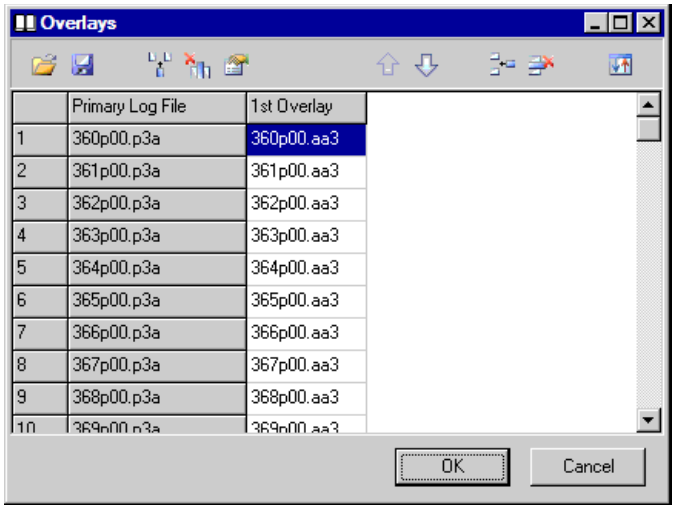
The File menu provides additional display options.

Historical Data Overlay

To display up to three additional sounding files from the same survey line,

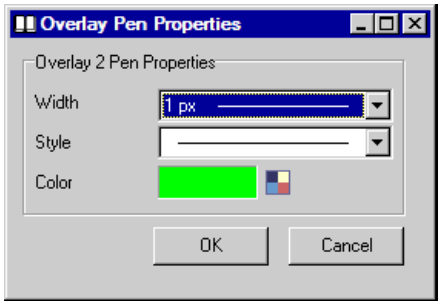
1. **Select FILE-OVERLAY.** A dialog will appear with your base survey files listed under Primary Log File.

FIGURE 4-37. File Overlay Dialog



2. **Click in the top cell of the 1st Overlay column, click the File Open icon and select the catalog file** containing your overlay files. The files will be listed in the order they appear in the catalog.
3. **If the lines names in the overlay file are unmatched with those of the primary file, click the Sort Files icon**.
4. **Set the pen properties for the overlay file** by clicking the Overlay Draw Parameters icon. A dialog will appear for you to set line width, style and color.

FIGURE 4-38. Overlay Pen Properties Dialog



5. **If you want an additional overlay, click the Add Overlay icon and repeat the process for each one**. The SINGLE BEAM EDITOR supports up to three overlay files.
6. **Save your overlay settings. (optional)** Click the Save icon and name your settings. The parameters in this dialog will be saved, by default, to you project with an OVL extension.

If you have multiple file combinations that you want to display, save an OVL file for each combination, then quickly switch from one to another by clicking the File Open icon and selecting the appropriate OVL file.

7. **Click [OK]** to return to the editor.

The superimposed file cannot be edited. *It is only used as a reference*, should you want to compare the current data file to a previous survey of the same line.

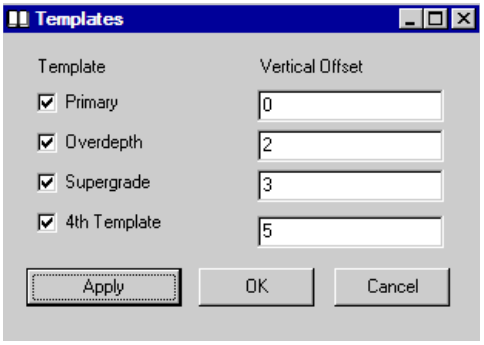
You can also display up to four channel templates in the profile window. These are based on the templates of the primary files.

Channel Template Overlay

To display the channel templates:

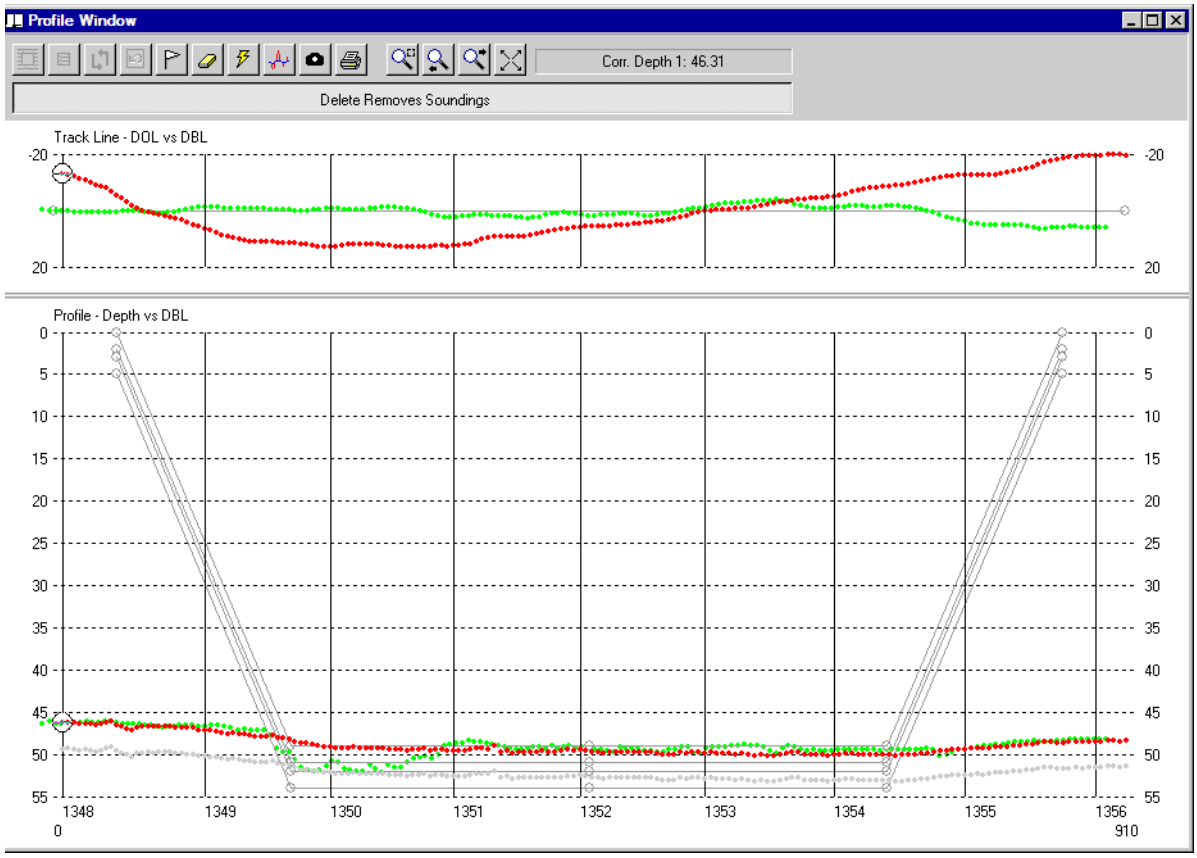
1. **Select FILE-TEMPLATES**. The dialog will appear.

FIGURE 4-39. *Template Dialog*



2. **Check the template levels** you wish to display
3. **For each selected level, enter the distance below the template,** which is defined in the primary data headers, each level will be drawn.
4. **Click [OK]**.

FIGURE 4-40. *An Example of Overlaid Files and Templates*



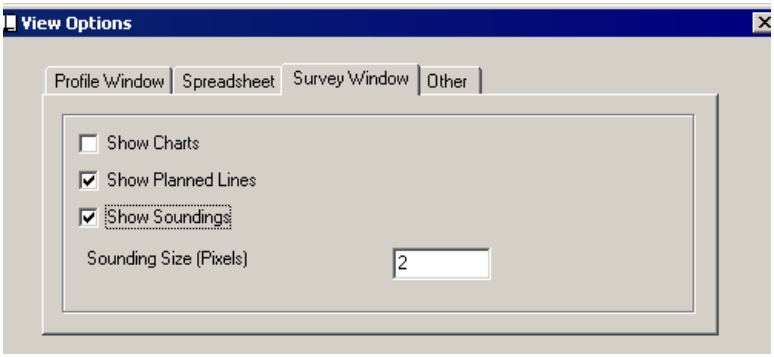
SURVEY WINDOW DISPLAY SETTINGS IN THE SINGLE BEAM EDITOR

The Survey Window Tab of the View Options dialog (F9) controls the Survey Window display. These options allow you to see bottom trends (slopes and bumps) or historical features (such as wrecks and pipelines). The track lines and events may be superimposed against:

- Background charts
- Planned lines
- Soundings

NOTE: A change in the *Show Charts* option will only be implemented after you restart the SINGLE BEAM EDITOR.

FIGURE 4-41. *View Options--Survey Window*



SPREADSHEET WINDOW DISPLAY SETTINGS IN THE SINGLE BEAM EDITOR

The Spreadsheet Tab of the View Options dialog (F9) enables you to select which items you want to see in the Spreadsheet Window.

FIGURE 4-42. *View Options--Spreadsheet Tab*

Items available are listed on the left, while items selected are listed to the right. Select items in either column then use the [Add=>] and [<=Remove] to include or omit them from your spreadsheet display...

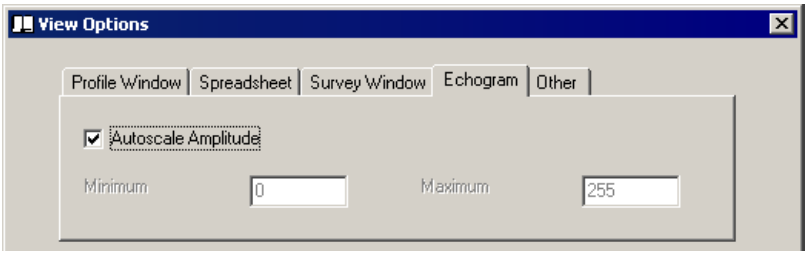
NOTE: The list of items available is maintained in alphabetical order. The list of items selected shows the order that the columns will be displayed in the spreadsheet. Normally, they will be listed in the order that they are selected. However, if you wish to insert a column in the middle of the list, select the item in the selected items list that you wish your new selection to follow. The next added items will be inserted there.

- **If Autorefresh is selected**, the spreadsheet will be automatically synchronized to the graphical windows. This is great if your data files are small enough (and you have a fast computer or both). This can become a cumbersome process, however, if you have large data files or a slow computer (or both). To solve this problem you can deselect Autorefresh while you are editing.
- **If Autorefresh is deselected**, when data is changed in one of the other windows (profile, survey, tide, etc), the change is not reflected in the spreadsheet but [Refresh] will be enabled to update it on an as needed basis. Spreadsheet editing is when it is out of synch with the other windows

ECHOGRAM DISPLAY SETTINGS IN THE SINGLE BEAM EDITOR

The Echogram view options control the scale of the display in the Echogram window.

FIGURE 4-43. *View Options--Echogram Tab*

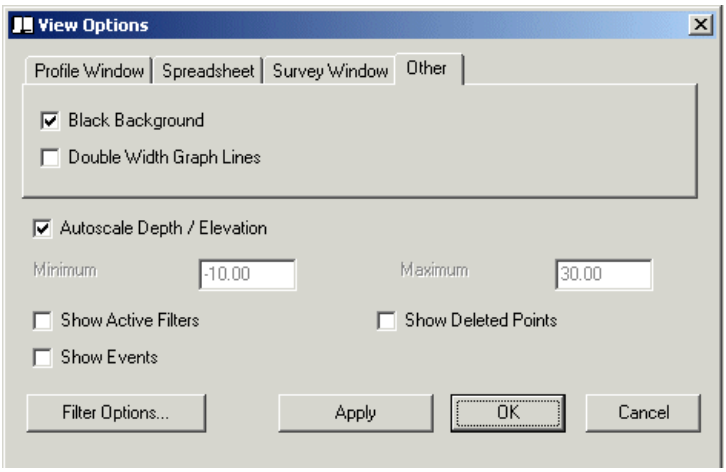


Autoscale Amplitude automatically adjusts the scale of the display to fit the amplitude of the data. You can manually set a constant range by clearing this option and entering your desired scale range.

OTHER DISPLAY SETTINGS IN THE SINGLE BEAM EDITOR

The Other Tab of the View Options dialog (F9) just provides a place for display settings that don't fit any other category. There are also a few settings that are available regardless of which tab is selected.

FIGURE 4-44. *View Options--Other Tab*



Other Tab:

- **Black Background** provides a choice to use black instead of white background in the the SINGLE BEAM EDITOR windows.
- **Double Width Graph Lines** thickens the sounding lines in the Profile Window.

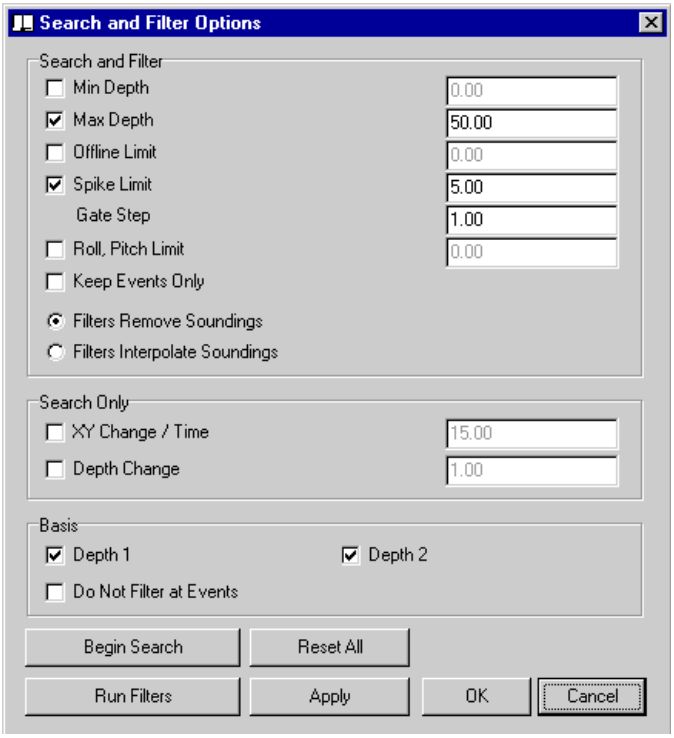
Always Available in View Options:

- The **Autoscale Depth/Elevation** determines the scaling of the depth profile based on the minimum and maximum depth in the data file. You can manually set the scale by deselecting this option and entering Minimum and Maximum Depths.
- **Show Active Filters** marks all points that would be omitted based on the current Search and Filter settings with a yellow "X".
- **Show Events** determines if the events are labelled in the Survey window.
- **Show Deleted Points** marks all points that have been deleted in The SINGLE BEAM EDITOR with a red “X.

SEARCH AND FILTER OPTIONS IN THE SINGLE BEAM EDITOR

Open the Search and Filter Options dialog by selecting EDIT-SEARCH AND FILTER OPTIONS (Ctrl+F). Search and Filter Options are used by the SINGLE BEAM EDITOR to search for data outside of these user-defined limits. You can instruct the the SINGLE BEAM EDITOR to display these points with a yellow "X" by checking Show Active Filters in the Display Options. The SINGLE BEAM EDITOR can also automatically delete all of these points, however this is not a recommended process for anything but getting a fast and approximate idea of your results.

FIGURE 4-45. *Search and Filter Options*



Search and Filter Options:

- **Min. Corrected Depth** and **Max Corrected Depth** reject any depths which are outside user-specified Minimum and Maximum Allowable Depths

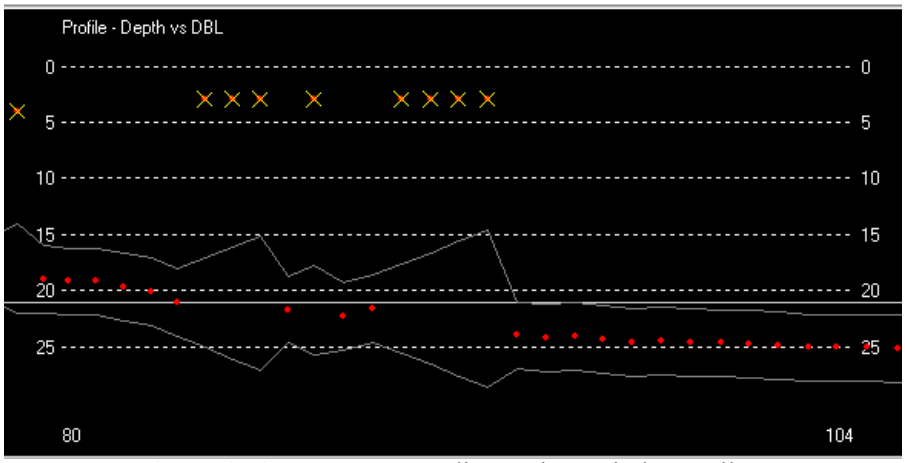
Beware!

BEWARE! *if you use these options and are inverting depths!* The program first inverts the depth and then looks at the depth range. If the program makes all of your depths negative and you have a depth range set between 2.0 and 50.0, every depth will be rejected and you will be presented with a blank spreadsheet. (OOPS!)

- **Offline Limit** rejects any points that are more than a specified distance away from the planned survey line.
- **Spike Limit** defines a gate above and below an accepted depth. If the net depth is outside the gate, it is "rejected" and the gate is expanded by adding the Gate Step to the Spike Limit. When a depth is accepted, the gate collapses to that depth level plus and minus the Spike Limit.
  In the following figure, the Spike Limit is 3 and the Gate Step is 1. Each time a sounding is more than 3 units deeper or shoaler than the previous one, it is filtered out (yellow 'X') and the spike limit increases to 4. The process is repeated with the next sounding and wider spike limit until we get a sounding that falls within the spike limit. In this segment, several in a row all fell within the 6 unit range. The next three soundings were filtered because they were outside of the (expanding) spike limit. The next sounding fell within the limits

so the gate again narrowed to 3 units either side of that depth and the procedure continued on to the next point.

FIGURE 4-46. *Spike Limits and Gate Steps in the Profile Window of the SINGLE BEAM EDITOR*



- **Roll, Pitch Limit** removes soundings where pitch or roll are greater than a user-specified number of degrees.
- **Keep Events Only** removes all soundings except those that occur on the event**.**
- **Filters Remove Soundings** and **Filters Interpolate Soundings** offer a choice about how the filtering option affects your data. During the filtering process, soundings outside of the Search and Filter settings can be deleted or interpolated according to this selection.

Search Only Options:

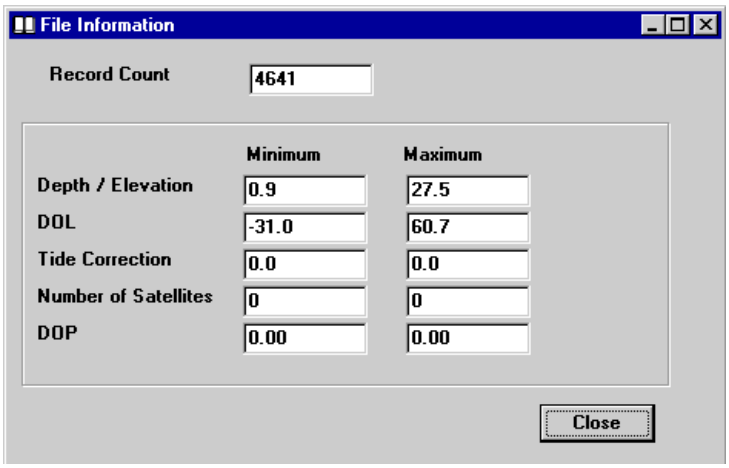
- **XY Change/Time** and **Depth Change** are used with the Search feature to seek bad data points based on the predicted position for the Position (XY) and Depth. If the actual value is too far from the predicted value, it is assumed the data point is bad and the cursor is moved directly to that point. You must decide what, if anything, to do about it.
- **Search Basis** determines what data is included in the search and filter operations. You can choose Depth 1, Depth 2 or both. You can elect to filter all of the data or only points that are not event marks. Some users wish to read the event marks to maintain the integrity of the track line. If a point with an event mark is removed, the event mark will be moved to the next point when you plot track lines.

SINGLE BEAM EDITOR STATISTICS

The SINGLE BEAM EDITOR provides statistics relating to your currently loaded files.

File Information includes ranges of depths, distance off line, tide correction values, number of satellites and DOP readings for the loaded file. Select FILE-INFORMATION (or click the icon) and the File Information statistics will appear.

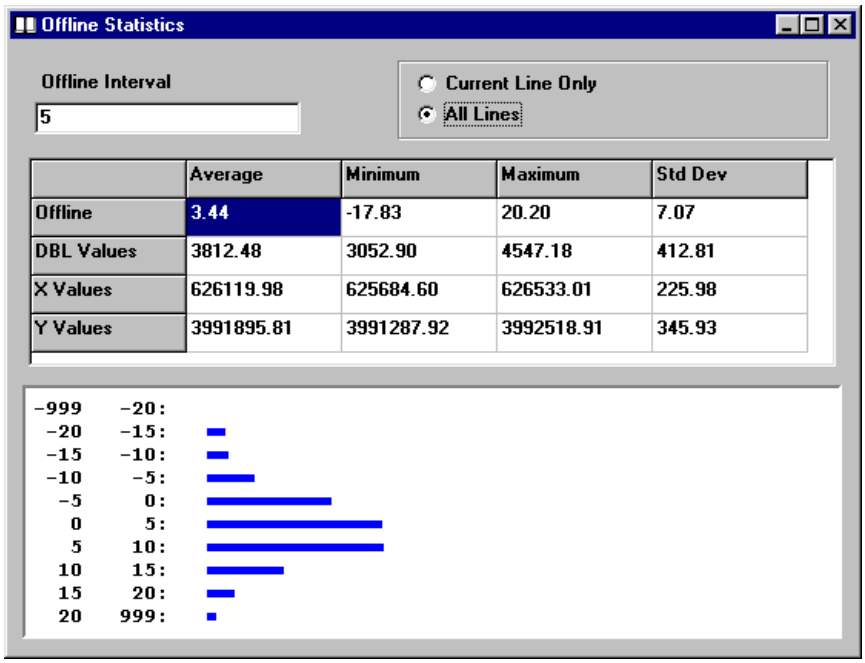
FIGURE 4-47. *A Sample File Information Dialog*



The **Offline Statistics** option displays an offline histogram of the survey data. It provides an average position, in case you logged data over a point for a couple of minutes to get a statistically calculated position.

Select FILE-OFFLINE STATISTICS and the dialog will appear. You can change the Offline Interval and view statistics about one line or all of them.

FIGURE 4-48. *Offline Statistics Dialog*



EDITING DATA IN THE SINGLE BEAM EDITOR

The SINGLE BEAM EDITOR provides several tools you will use to clean your raw data set:

- Manual Editing
- Automatic Editing
- Depth Smoothing

Typically, you will use the automated methods to remove data that is obviously in error then continue using manual methods as you examine and clean your data on a more granular level.

MANUAL EDITING SINGLE BEAM DATA

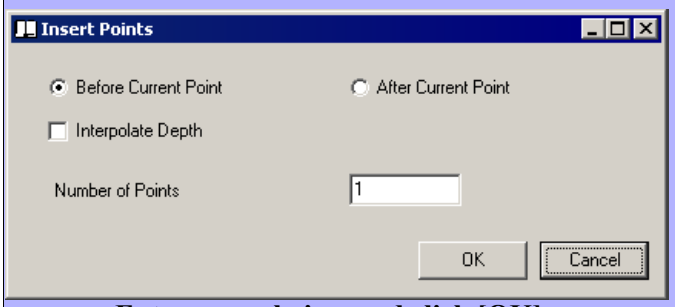
This process is typically done in the Profile window while you scroll using the arrow keys on the SINGLE BEAM EDITOR shell. The data in the Survey and Tide/Draft Corrections windows may also be edited in this manner.

1. **Scan and edit your data.** You can edit out the soundings that are obviously bad data and insert points where there are gaps in your data. This is optional, but it may save you a bit of time in the search and filter process.

TABLE 4-1. *Point Editing Methods*

- **To delete individual points** select the point with the cursor and click the delete point icon.
- **To manually Insert Points** where there are gaps in your data.
  a. **Position your cursor** adjacent to where you want to insert your point(s).
  b. **Select EDIT-INSERT POINT…**The Insert Points dialog will appear.

FIGURE 4-49. *Insert Points Dialog*



c. **Enter your choices and click [OK]**.

Indicate whether you want to insert data before or after the current cursor position.

Interpolate Depth assigns depths, tide corrections and draft corrections to the inserted points based on the points positioned on either side. Clear this option to insert depths all with value of zero.

Number of Points: Specify how many points should be inserted. You can insert up to 999 points (total) in your file. If you attempt to insert 1000 or more points, a message that you have reached the maximum number of points will be displayed and no points will be inserted to your file.

TABLE 4-2. *Block Editing*

- **To delete a block of points**, define the range of points then delete all points inside or outside the block.
  a. **Select a block of data points**:
     - **In the Track Line or Profile:** Click and drag from one corner to the diagonally opposite corner. (If you're unhappy with the results, just try again.)
     - **In the Profile window:** Flag a point at each end of the range by selecting it and clicking the flag icon.
  b. **Delete the Data** by clicking the Delete Inside Block (I) or Delete Outside Block (O) icon. The data will either be erased or interpolated according to the setting in the Profile Window.
- **To restore deleted points:**
  a. In the View Options dialog, **select the View Deleted Points option.** Each deleted point will be displayed in your Profile with red 'X'.
  b. **Select the points you wish to restore** by dragging a box around them with your mouse.
  c. **Click the Undelete Block Icon**.

TABLE 4-3. Omitting Lines

- **To omit lines with little or no data** by selecting the line and clicking the Ignore Current Line icon. The ignored lines will no longer be displayed as you scroll through your data nor will they be saved with your edited data.

TABLE 4-4. *Swapping Frequencies*

- **To swap High Frequency data with Low Frequency data**. Just click and drag a block around the data that you want to swap and click the Swap Depths Inside Block icon.

TABLE 4-5. *Depth Differences*

- **To calculate the difference between the high and low freqency depths**, select EDIT - DEPTH1-2 DIFFERENCES or EDIT - DEPTH2-1 DIFFERENCES, then click [Refresh] in the spreadsheet window. Depth 1 will assume the value of the calculated difference. Depth 2 will remain the same.

2. **Return to the first selected file**.
3. **Set your Search and Filter criteria**.
4. **Select EDIT-FIND NEXT (F3).** The SINGLE BEAM EDITOR will systematically scan the survey data for soundings outside of the

Search and Filter limits and position your cursor at that point in sequence.

5. **Examine and edit your data.** Decide to delete the sounding (and possibly others around it) or leave it and search out the next.
6. **Continue to repeat the last two steps** until the the SINGLE BEAM EDITOR has progressed to the end of your data.

AUTOMATIC EDITING SINGLE BEAM DATA

1. **Set your Search and Filter criteria**.
2. **Select FILE-FILTER ALL and wait**. the SINGLE BEAM EDITOR automatically deletes all points outside the limits from all of the selected data files. You may do the same thing on a line-by-line basis by clicking the Filter Line icon in the Profile Window.

Beware!

BEWARE! **It's fast! It's easy! It's DANGEROUS!!!** No computer program can replace human intelligence and common sense when it comes to editing data. Use this feature with caution!

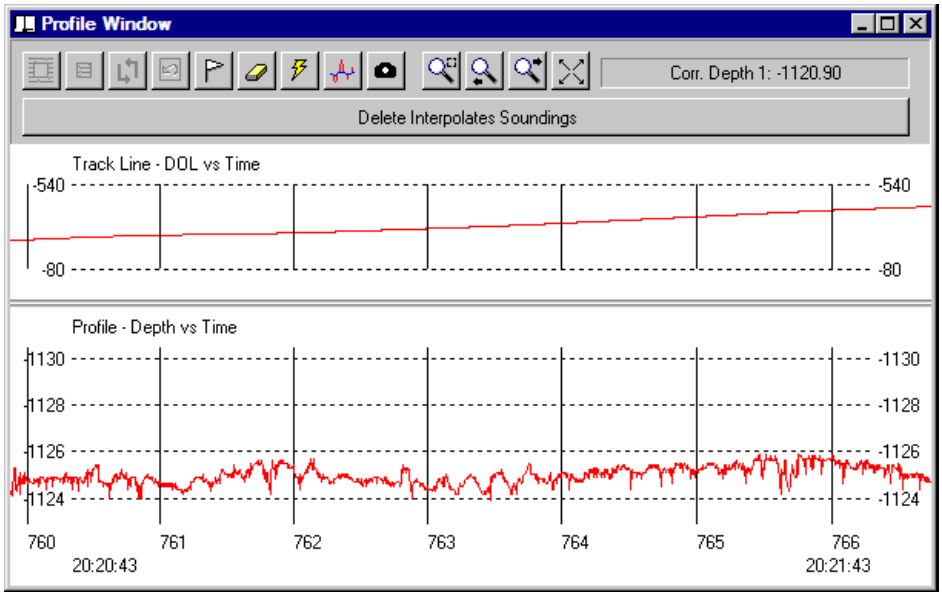
SMOOTHING YOUR DATA IN THE SINGLE BEAM EDITOR

If you have been surveying in rough waters and do not use a heave sensor, your data can be very jagged. In cases such as these, you can smooth the position and depth of the corrected soundings.

Beware!

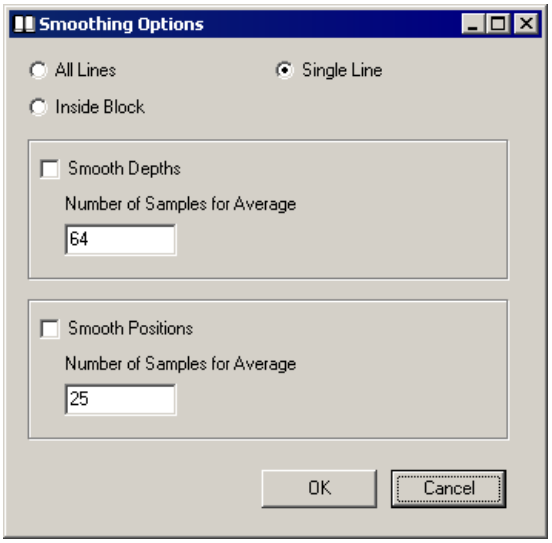
BEWARE! *This is not highly accurate*. We recommend properly measuring heave, pitch and roll with an MRU. This smoothing is only a close approximation.

FIGURE 4-50. *Sample Data Before Smoothing*



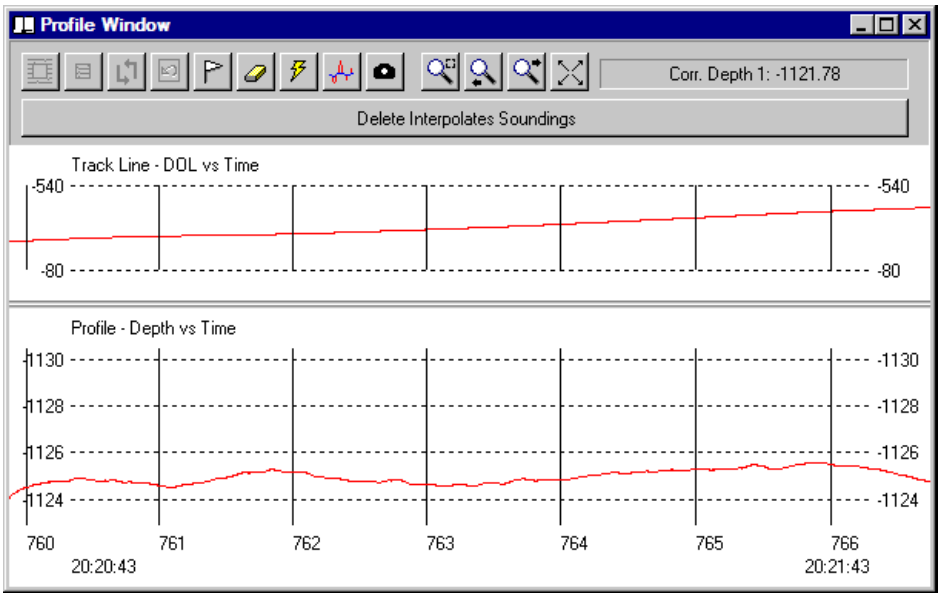
1. **Calculate the approximate number of soundings in about three heave cycles.** To do this,
   a. Zoom in on a small area of your profile view.
   b. Note the time it takes for 3 full cycles. (Place your cursor and note the time at the crests of the 2 heave cycles, three cycles apart. Calculate the difference.)
   c. Multiply the time by the number of soundings/second.
2. **Decide the number of soundings used to smooth the horizontal positions.** The default is 25, but you can use another value if you think it gives you better results.
3. **If you want to smooth only a selected area, click and drag the cursor to draw a block around that area**.
4. **Click the smooth icon.** A dialog will appear.

FIGURE 4-51. *Smoothing Options Dialog*



   a. **Set what data you want to smooth.**
      - **All lines currently loaded to the editor**
      - **Only the current line**
      - **Area Inside the block**
      - Choose to smooth depths, position or both.
   b. **If you are smoothing depths, enter the number calculated in step 1 for your number of samples under that option.**
   c. **If you are smoothing positions, enter the number of samples you wish to average** under that option.
   d. **Click [OK].**

FIGURE 4-52. The Same Data After Smoothing



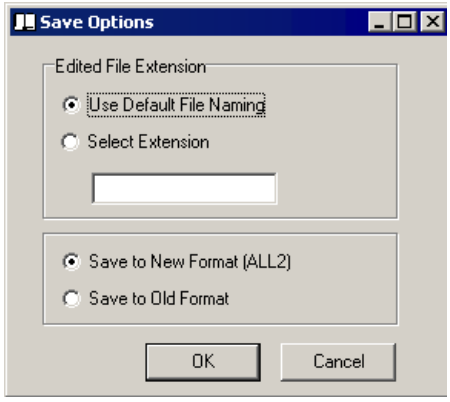
SAVING EDITED SINGLE BEAM DATA

When you have finished editing your data, save your edited data by selecting FILE-SAVE. Your data will be saved to a file of the same name in the project's Edit directory.

You can use a custom the extension for your edited files.

1. **Select FILE-SAVE OPTIONS**. The Save Options dialog will appear.

FIGURE 4-53. Save Options Dialog



2. **Select Extension, type in the extension that you want to use and click [OK].** When you save your data, the edited files will be saved with the specified extension.

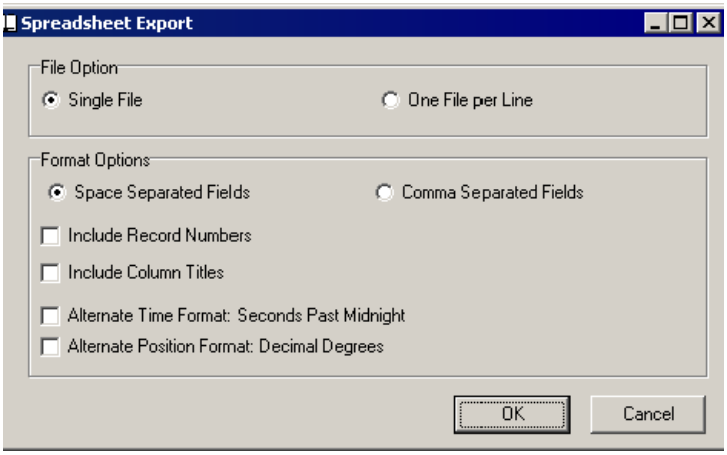
The edited data is always stored to a new data file. This preserves the raw survey data so you may begin with the original data set at any time. (Of course, you also have a backup of these files right?) The data files are saved in the ALL file format that is the format required by most of the final product programs.

EXPORTING EDITED SINGLE BEAM DATA TO A TEXT FILE

You can export the contents of the spreadsheet to a text file.

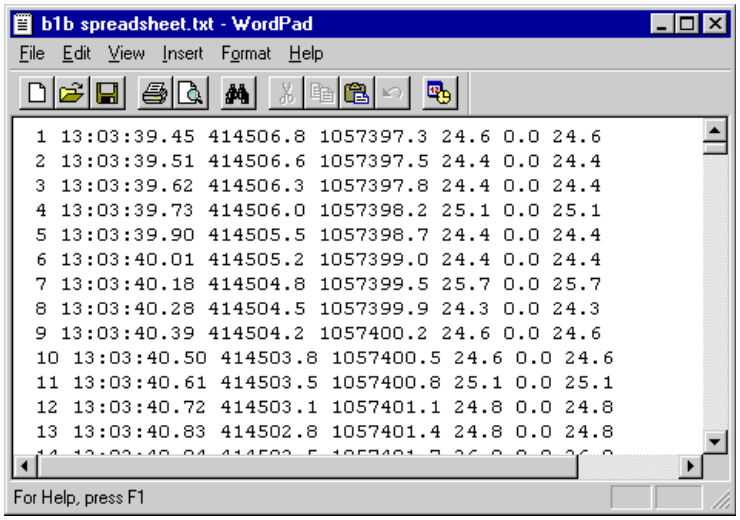
1. **Click [Export].** The Spreadsheet Export dialog will appear.

FIGURE 4-54. *Spreadsheet Export Dialog*



2. **Select your file and format options.** (The options are pretty self-explanatory.) Click [OK]. A File Selection dialog will appear for you to name the text file and designate where it should be saved.
3. **Name your file and file destination and click [OK].** The file will be saved with a TXT extension. You can view your text file in any text editor.

FIGURE 4-55. *A Sample Exported Spreadsheet Text File*



SOUNDING SELECTION PROGRAMS FOR SINGLE BEAM SURVEYS

HYPACK® has multiple routines for Sounding Selection in single beam data. One may be more appropriate than another, depending on your final product.

COMPARISON OF SOUNDING SELECTION METHODS FOR SINGLE BEAM DATA

Before you decide which sounding selection method you will use, you should first consider what type of data you need for your final product.

TABLE 4-1. *Final Product Input Requirements*

Program	Input Files
Cross Sections & Volumes	Edited files from the SINGLE BEAM EDITOR
Hyplot–Track lines	Edited files from the SINGLE BEAM EDITOR
Hyplot–Soundings	Sorted files from a sounding selection routine
Export	Edited or sorted files
TIN Model	Sorted files from a sounding selection routine (unless you have a lot of time on your hands!)

You must choose a sounding selection method that outputs your required file format, but there are several secondary considerations. Table 4-2 compares the sounding selection methods with regard to these other considerations.

TABLE 4-2. *Comparison of Sounding Selection Methods*

Method	SB SELECTION	SORT	CROSS SORT	MAPPER
Input file Type	• ALL (Edited)	• ALL (Edited) • XYZ	• ALL (Edited)	• ALL (Edited) • XYZ • HS2
Output File Type	• ALL (Edited)	• ASCII XYZ	• ALL (Sorted)	• ASCII XYZ • XYZ ID • Matrix (*.MTX)

Method	SB SELECTION	SORT	CROSS SORT	MAPPER
Other Files Needed	None	None	Plotting Sheet (*.PLT)	Matrix (*.MTX)
Plot Results Perpendicular to Planned Line	Yes	Yes, to the nearest active survey line.	Yes	Yes, to the nearest active survey line.
Guaranteed No Overwrites in Plotting	With spacing sufficient for font plotted.	Yes	Yes	No
Sounding Selection	• Distance • Minimum & Maximum	• Minimum Only	• Biased toward Minimum	• Minimum • Maximum • Range • Average • Closest to Cell Center
Speed	Fast	Slow	Fast	Fast
Maintains Sounding Location	Yes	Yes	Yes	Optional, depending on sounding selection
Pleasing to the Eye	Yes	No	Yes	Can be

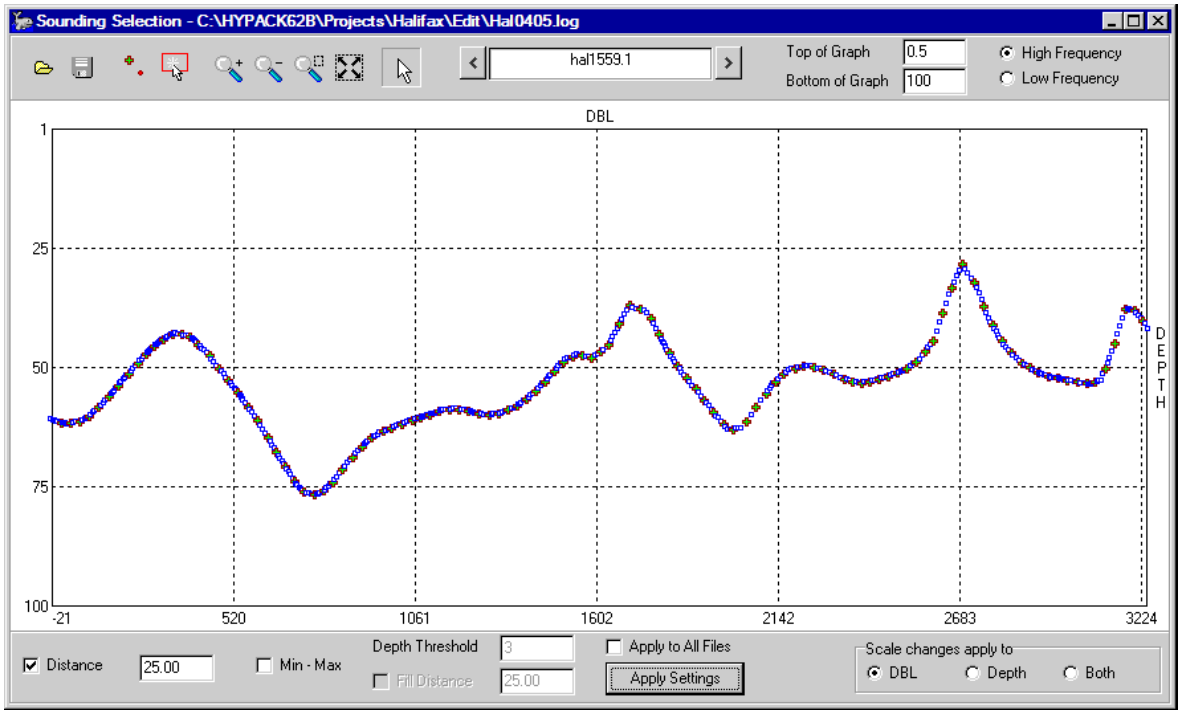
SB SELECTION

SB SELECTION enables you to extract a subset of an edited All format dataset for the purpose of plotting. Soundings are selected based on distance, the highs and lows of your dataset, or both. The program then generates a new set of All format files containing only the selected soundings. This process *does not change the original data set*.

RUNNING SB SELECTION

1. **Launch the SB SELECTION program** by selecting PROCESSING-SOUNDING SELECTION-SB SELECTION. The SB SELECTION dialog will appear.
2. **Load your data files** by clicking the File Open icon and choosing your file. SB SELECTION reads individual All format files or a LOG file containing them.
3. **Adjust your sounding display**.
4. **Select your soundings**.

FIGURE 4-1. *Soundings selected every 25 survey units along the survey line in SB SELECTION*



5. **Save the results** by clicking the save icon. By default, your new All format data is saved to the Sort folder in your project. The new catalog (*.LOG) defaults to the same name as the original LOG file. The sorted files will be saved with an SOS extension.

DISPLAY OPTIONS IN SB SELECTION

When you first load a data set, the first file in your catalog is drawn to the graph and the line name is displayed on the toolbar. You can scroll through the files in the LOG using the arrow keys on either side of the file name.

The toolbars above and below the data display provide tools for adjusting the display as follows:

- **High and Low Frequency:** If you have dual frequency data, choose which data to display.
- The **Scale Changes apply to** options control how your zoom tools affect your display.
  - **DBL** affects only the horizontal scale
  - **Depth** affects only the vertical scale
  - **Both** affects both horizontal and vertical scales
- The **Zoom tools** direct how the scale should be changed
  - **Zoom In** decreases the scale
  - **Zoom Out** increases the scale
  - **Zoom Window** then click and drag your cursor across the graph to select the data range you want to view. The program sets the accordingly.
  - **Zoom Extents**: The program sets a scale at which all data is displayed.
- **Top of Graph** and **Bottom of Graph** enable you to manually set the vertical range of your graph. These settings will be overridden by applying the scale changes to depth while using the zoom tools.

SOUNDING SELECTION OPTIONS IN SB SELECTION

Once the data is displayed in SB SELECTION, you are ready to select the soundings for export to the new files. You can do this manually or by using one of the automated methods. In each case, the selected soundings will be marked with a green "+" symbol.

Manual Selection

To manually select your soundings, click the Select Soundings Icon then click on each sounding in the graph that you want to export.

Automatic Selection

You can automate your sounding selection based on distance or on the inflection points in your data. Set your selection options and apply your settings to the data by clicking [Apply Settings]. By default, the program will select from all files in the catalog. However, you may elect to select from only the currently displayed line by clearing the '**Apply to All Files**' option.

- **To select soundings based on distance**:
  a. **Check the Distance option**.

b. **Enter the interval**, in survey units, at which you want to select soundings.

c. **Apply the settings.**

- **To select soundings based on the data inflection points**:

a. **Select Min-Max**.

b. **Set the Depth Threshold**. This value affects how much rise or fall in the data will result in a sounding selection. A smaller threshold will select soundings at smaller changes in the contours of your data than larger numbers. Begin with the default value of 3 and increase or decrease the value to suit your purposes and your dataset.

c. **Set the Fill Distance** (Optional). The Fill Distance selects soundings at the user-defined interval between the soundings selected at the inflection points.

d. **Apply the settings.**

Deselecting Soundings

To de-select soundings, click on the Undo Selections Icon and drag a box around one or more selected soundings.

MAPPER PROGRAM

The **MAPPER** program is a “binning” or “gridding” program. It is normally used to reduce the voflume of multibeam or multiple transducer data, but it can also be used with single beam data.

You must first make a Matrix file (*.MTX) in the MATRIX EDITOR. A Matrix consists of a rectangular area filled with individual cells.

The MAPPER programs can save one sounding for each cell.

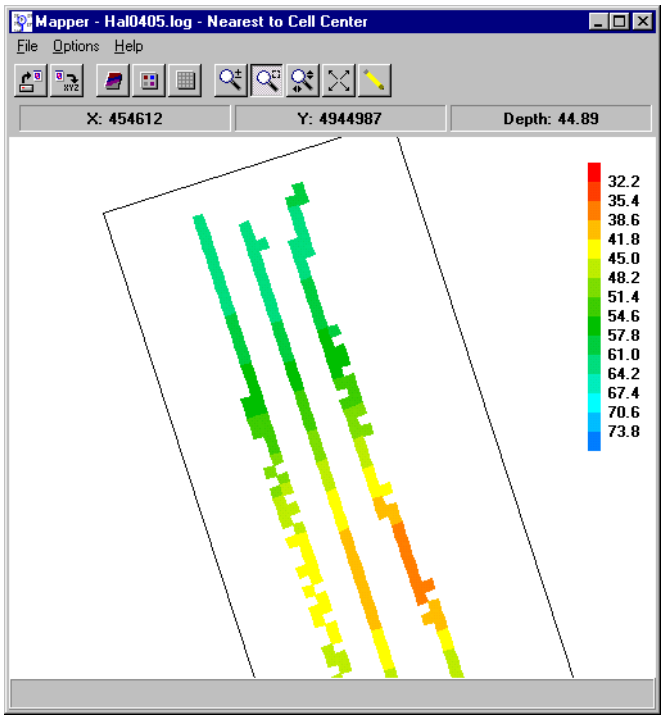
Advantages of MAPPER

- It is extremely fast
- It can be used to judge the quality (range per cell) of the data.
- It can be biased to select the data important to you.

Disadvantages of MAPPER

- Plotted soundings may overlap.
- You can move soundings if you elect to save the soundings at the center of the cell
- If your data is thin, there will be empty cells. MAPPER does not interpolate data.

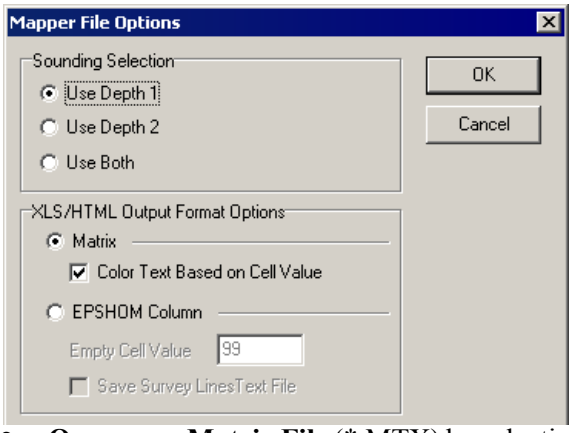
FIGURE 4-1. *The MAPPER Window*



RUNNING THE MAPPER PROGRAM

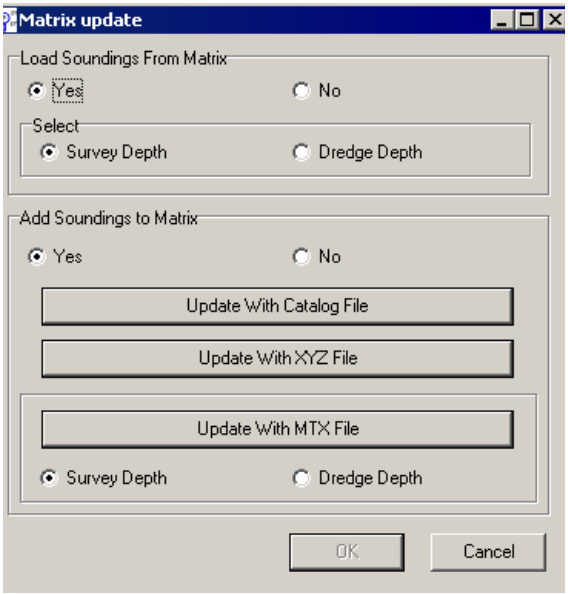
1. **Create a Matrix File** (*.MTX) of your project area. The cell size in the matrix determines the density of data in the thinned data set.
2. **If you are mapping dual frequency data,** select the depth information you want MAPPER to read: depth 1, depth2 or both.

FIGURE 4-2. *Mapper File Options*



3. **Open your Matrix File** (*.MTX) by selecting FILE-OPEN MATRIX and choosing the correct file from the file selection dialog .
4. **Set the data to be included in the matrix** .
   - **If you have chosen a filled matrix**, the Matrix Update dialog appears.

FIGURE 4-3. *Selecting the Data in your Matrix*



You have several choices. Notice, if you are using data from a filled matrix, you must indicate which depth to use as the Survey

Depth in the new matrix. Any added soundings will overwrite the survey depths of the original matrix.

Data Loaded	Load Soundings From Matrix	Add Soundings To Matrix
Only the data the matrix already contains	Yes	No
Use the matrix boundaries, but load different sounding data	No	Yes and click the button corresponding to the type of the file where your data is currently saved to select from a file selection dialog.
Data contained in the matrix data merged with additional data.	Yes	Yes and click the button corresponding to the type of the file where your data is currently saved to select from a file selection dialog.

- **If you have opened an empty matrix or wish to add more sounding data to the current matrix**, select FILE-LOAD SOUNDINGS and choose the additional sounding files.

Once the data has been read into the Matrix, it is displayed in the MAPPER window.

5. **Set your mapping options.** There are several choices regarding the sorting and display of your data in MAPPER.
6. **Save your results** by selecting FILE-SAVE SOUNDINGS and your required output. You can you to save the current selections to your choice of several output formats:
   - **ASCII XYZ**: Used in other HYPACK® modules or read by a text editor.
   - **MTX file**: Used in other HYPACK® modules.
   - **XLS:** Microsoft Excel Spreadsheet format. (Require format options.)
   - **HTM:** Displayed in your web browser. (Output according to file options.)
   - **NetCDF:** Format for Fledermaus software. (Requires matrix file with '0' rotation.)

More Information

- "Creating a Matrix File with the Matrix Editor" on page 2-254
- "Mapper Options" on page 4-62

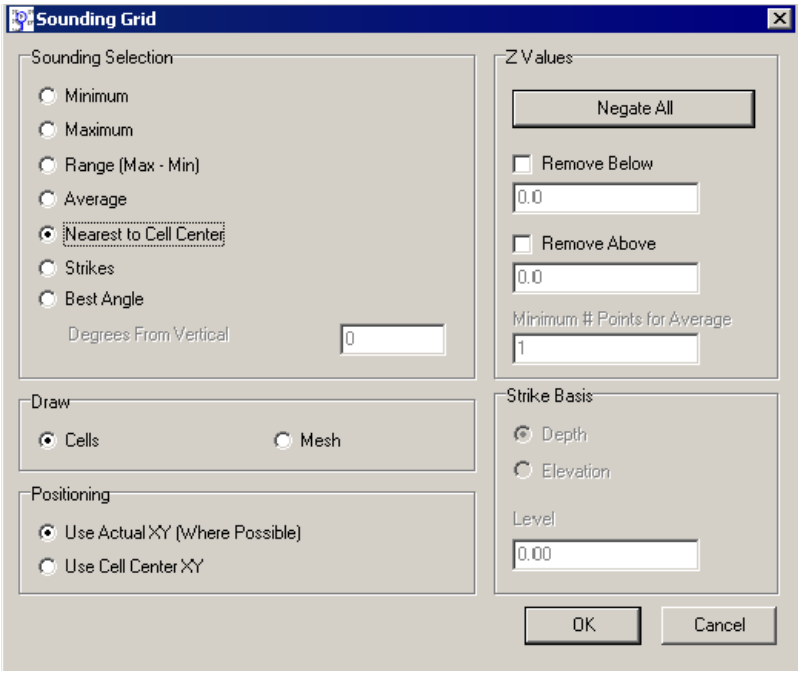
MAPPER OPTIONS

MAPPER DATA SELECTION OPTIONS

OPTIONS-DATA SELECTION specifies which item will be displayed and saved to file. It enables you to specify what information is displayed and if it is saved in its actual position or at the center of the matrix cell.

Most of the items are self-explanatory.

FIGURE 4-4. *Data Selections Window in MAPPER*



Sounding Selection determines which value will be saved to each matrix cell.

- **Minimum**
- **Maximum**
- **Range**
- **Average**
- **Nearest to Cell Center**
- **Strikes**
- **Best Angle**

Range is the maximum minus the minimum sounding value.

Strikes enables you to save and display only soundings that are above or below a user-specified **level**. It does not save the sounding, but saves the difference between the sounding and the specified level.

Strike Basis specifies whether the Strikes should be based on the amount the depth is less than the strike level (Depth) or the amount the depth is deeper than the strike level (Elevation).

Best Angle allows you to set which beam from a multibeam sensor is read to update the matrix by defining the angle from center.

NOTE The sounding nearest to cell center at its actual position will give you the best volumes calculations.

Draw lets you specify whether to draw the matrix presentation screen as solid color-filled cells or a wire mesh pattern.

Positioning enables you to save the data in its actual position (where possible) or in the center of the cell. When you save the data in the center of the cell, it moves the data, not always a great thing to do.

Z-Value Options:

- **[Negate All]** inverts all depths.
- **Remove Below and Above** omit all cells whose depths according to the user-defined criteria.

SOUNDING COLORS IN MAPPER

Select OPTIONS-COLOR CODING to access the Color Settings dialog. This is the same dialog that is used to set the colors in HYPACK®. Any changes made here will also affect HYPACK® and SURVEY.

More Information

- "Sounding Color Settings in HYPACK®" on page 1-34

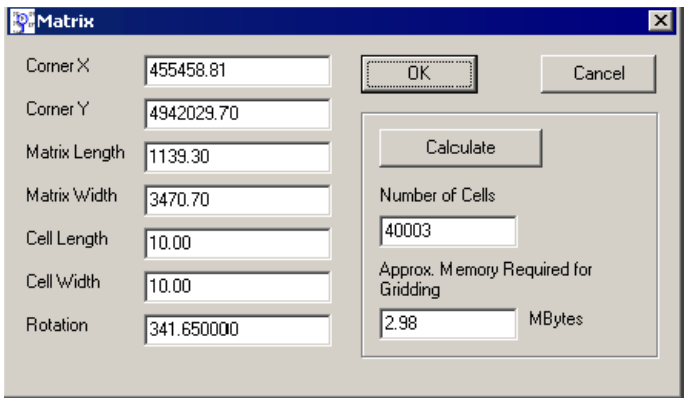
MAPPER MATRIX SETUP

OPTIONS-MATRIX SETUP enables you to edit the matrix parameters.

The number of matrix cells and the approximate memory required to use a matrix with the listed specifications in the binning process can be calculated and displayed by clicking [Calculate]. If you are not satisfied with the options, you can change the specifications for the matrix and recalculate.

NOTE If the matrix is changed, data must be re-read into the matrix, using the OPEN SOUNDINGS menu item .

FIGURE 4-5. *The Matrix Setup Dialog*



The Options menu also enables you to:

- **Erase the data from a filled matrix** by selecting OPTIONS-CLEAR MATRIX.
- **Fill your matrix with a user-defined depth** by selecting OPTIONS-FILL MATRIX. The Fill Matrix dialog will appear for you to set the depth. Click [OK] and the results will be drawn to the MAPPER screen.

FIGURE 4-6. *Fill Matrix Dialog*

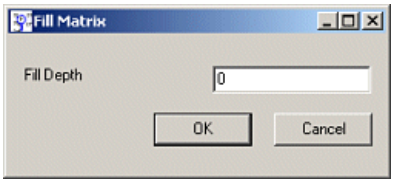
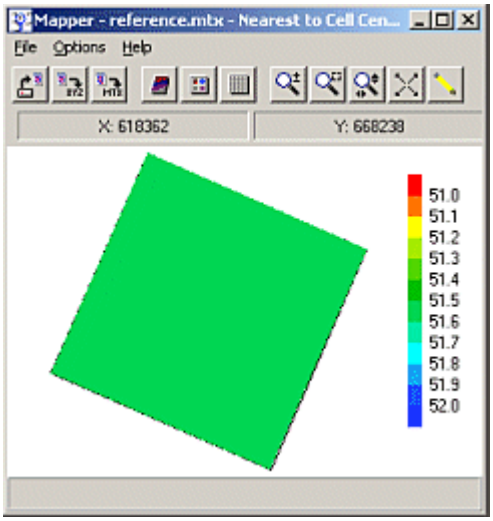


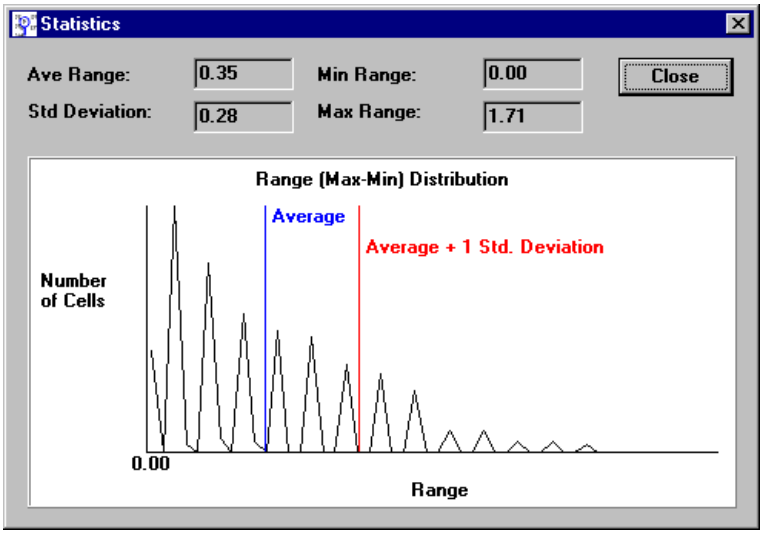
FIGURE 4-7. *Matrix Filled with Uniform Depth*



MAPPER STATISTICS

FILE-STATISTICS provides a plot of the Number of Data points vs. Depth Range per Cell.

FIGURE 4-8. The Statistics Window in MAPPER



EXPORTING DATA FROM MAPPER

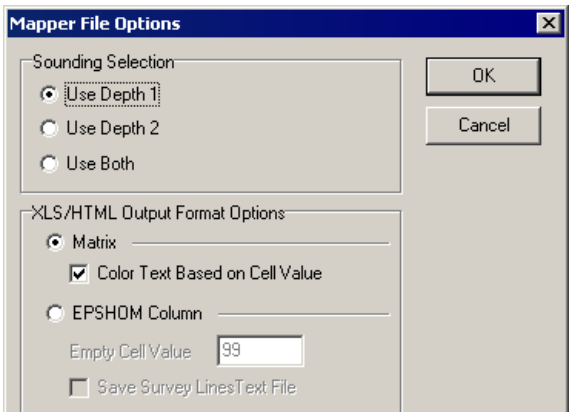
Once you have loaded your matrix and soundings, save your results. You have several output options.

- **ASCII XYZ**: Used in other HYPACK® modules or read by a text editor.
- **MTX file**: Used in other HYPACK® modules.
- **XLS:** Microsoft Excel Spreadsheet format. (Require format options.)
- **HTM:** Displayed in your web browser. (Output according to file options.)
- **NetCDF:** Format for Fledermaus software. (Requires matrix file with '0' rotation.)

If you want to export XLS and HTM, first check your output options in the Matrix File Options dialog.

To access the File Options dialog, select FILE-OPTIONS.

FIGURE 4-9. *Mapper File Options*



XLS/HTM Output Format Options:

- **Color Text Based on Cell Value** uses your project colors in your sounding output.

FIGURE 4-10. *HTML Output - Color Text Based on Cell Value*

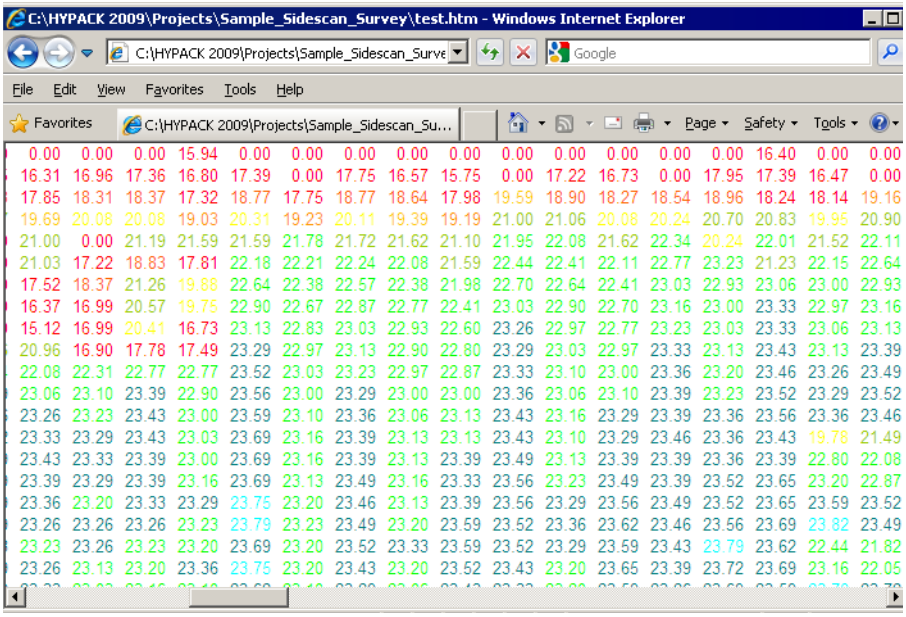
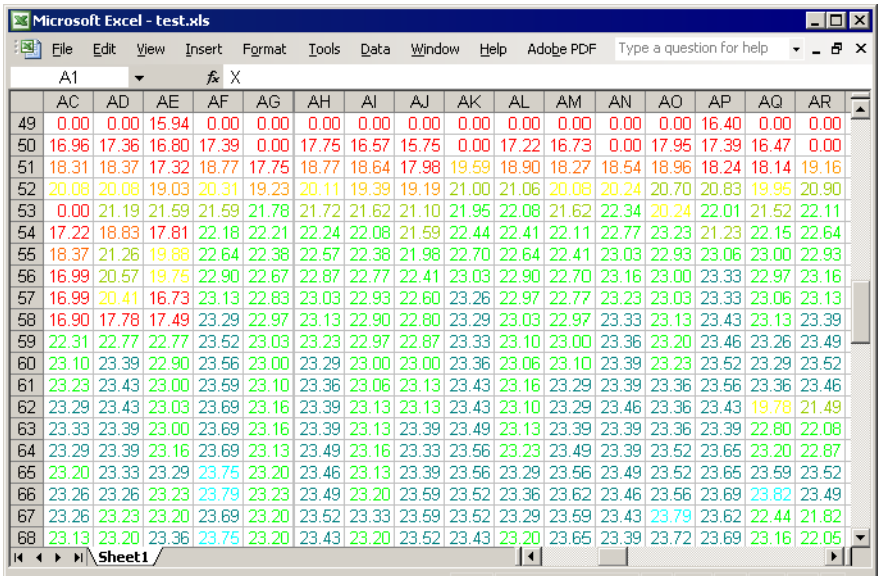


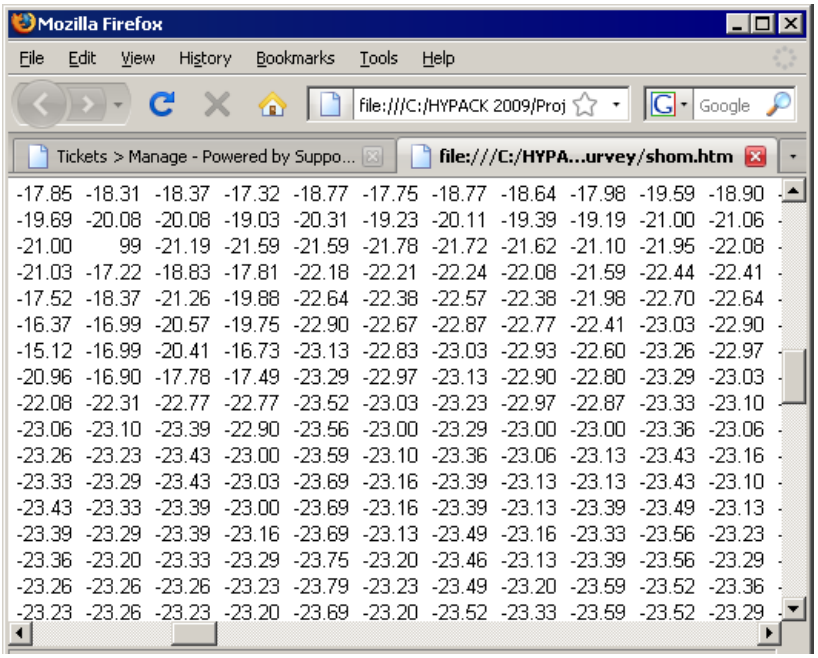
FIGURE 4-11. *XLS Output - Color Text Based on Cell Value*



	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
49	0.00	0.00	15.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.40	0.00	0.00
50	16.96	17.36	16.80	17.39	0.00	17.75	16.57	15.75	0.00	17.22	16.73	0.00	17.95	17.39	16.47	0.00
51	18.31	18.37	17.32	18.77	17.75	18.77	18.64	17.98	19.59	18.90	18.27	18.54	18.96	18.24	18.14	19.16
52	20.08	20.08	19.03	20.31	19.23	20.11	19.39	19.19	21.00	21.06	20.08	20.24	20.70	20.83	19.95	20.90
53	0.00	21.19	21.59	21.59	21.78	21.72	21.62	21.10	21.95	22.08	21.62	22.34	20.24	22.01	21.52	22.11
54	17.22	18.83	17.81	22.18	22.21	22.24	22.08	21.59	22.44	22.41	22.11	22.77	23.23	21.23	22.15	22.64
55	18.37	21.26	19.68	22.64	22.38	22.57	22.38	21.98	22.70	22.64	22.41	23.03	22.93	23.06	23.00	22.93
56	16.99	20.57	19.75	22.90	22.67	22.87	22.77	22.41	23.03	22.90	22.70	23.16	23.00	23.33	22.97	23.16
57	16.99	20.41	16.73	23.13	22.83	23.03	22.93	22.60	23.26	22.97	22.77	23.23	23.03	23.33	23.06	23.13
58	16.90	17.78	17.49	23.29	22.97	23.13	22.90	22.80	23.29	23.03	22.97	23.33	23.13	23.43	23.13	23.39
59	22.31	22.77	22.77	23.52	23.03	23.23	22.97	22.87	23.33	23.10	23.00	23.36	23.20	23.46	23.26	23.49
60	23.10	23.39	22.90	23.56	23.00	23.29	23.00	23.00	23.36	23.06	23.10	23.39	23.23	23.52	23.29	23.52
61	23.23	23.43	23.00	23.59	23.10	23.36	23.06	23.13	23.43	23.16	23.29	23.39	23.36	23.56	23.36	23.46
62	23.29	23.43	23.03	23.69	23.16	23.39	23.13	23.13	23.43	23.10	23.29	23.46	23.36	23.43	19.78	21.49
63	23.33	23.39	23.00	23.69	23.16	23.39	23.13	23.39	23.49	23.13	23.39	23.39	23.36	23.39	22.80	22.08
64	23.29	23.39	23.16	23.69	23.13	23.49	23.16	23.33	23.56	23.23	23.49	23.39	23.52	23.65	23.20	22.87
65	23.20	23.33	23.29	23.75	23.20	23.46	23.13	23.39	23.56	23.29	23.56	23.49	23.52	23.65	23.59	23.52
66	23.26	23.26	23.23	23.79	23.23	23.49	23.20	23.59	23.52	23.36	23.62	23.46	23.56	23.69	23.82	23.49
67	23.26	23.23	23.20	23.69	23.20	23.52	23.33	23.59	23.52	23.29	23.59	23.43	23.79	23.62	22.44	21.82
68	23.13	23.20	23.36	23.75	23.20	23.43	23.20	23.52	23.43	23.20	23.65	23.39	23.72	23.69	23.16	22.05

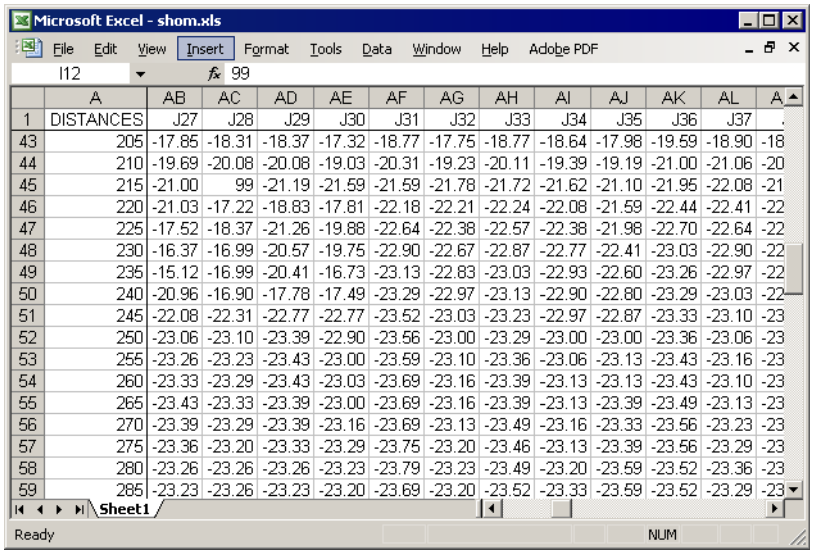
- The EPSHOM options always prints your soundings in black.
  - **Empty Cell Value** enables you to choose what value will be assigned to empty matrix cells.
  - **Save Survey Lines Text File** stores the EPSHOM XLS output, including column and row headers, to a text file where the cell delimiter is a forward slash.

FIGURE 4-12. *EPSHOM - HTM Output*



-17.85	-18.31	-18.37	-17.32	-18.77	-17.75	-18.77	-18.64	-17.98	-19.59	-18.90
-19.69	-20.08	-20.08	-19.03	-20.31	-19.23	-20.11	-19.39	-19.19	-21.00	-21.06
-21.00	99	-21.19	-21.59	-21.59	-21.78	-21.72	-21.62	-21.10	-21.95	-22.08
-21.03	-17.22	-18.83	-17.81	-22.18	-22.21	-22.24	-22.08	-21.59	-22.44	-22.41
-17.52	-18.37	-21.26	-19.88	-22.64	-22.38	-22.57	-22.38	-21.98	-22.70	-22.64
-16.37	-16.99	-20.57	-19.75	-22.90	-22.67	-22.87	-22.77	-22.41	-23.03	-22.90
-15.12	-16.99	-20.41	-16.73	-23.13	-22.83	-23.03	-22.93	-22.60	-23.26	-22.97
-20.96	-16.90	-17.78	-17.49	-23.29	-22.97	-23.13	-22.90	-22.80	-23.29	-23.03
-22.08	-22.31	-22.77	-22.77	-23.52	-23.03	-23.23	-22.97	-22.87	-23.33	-23.10
-23.06	-23.10	-23.39	-22.90	-23.56	-23.00	-23.29	-23.00	-23.00	-23.36	-23.06
-23.26	-23.23	-23.43	-23.00	-23.59	-23.10	-23.36	-23.06	-23.13	-23.43	-23.16
-23.33	-23.29	-23.43	-23.03	-23.69	-23.16	-23.39	-23.13	-23.13	-23.43	-23.10
-23.43	-23.33	-23.39	-23.00	-23.69	-23.16	-23.39	-23.13	-23.39	-23.49	-23.13
-23.39	-23.29	-23.39	-23.16	-23.69	-23.13	-23.49	-23.16	-23.33	-23.56	-23.23
-23.36	-23.20	-23.33	-23.29	-23.75	-23.20	-23.46	-23.13	-23.39	-23.56	-23.29
-23.26	-23.26	-23.26	-23.23	-23.79	-23.23	-23.49	-23.20	-23.59	-23.52	-23.36
-23.23	-23.26	-23.23	-23.20	-23.69	-23.20	-23.52	-23.33	-23.59	-23.52	-23.29

FIGURE 4-13. *EPSHOM - XLS Output*



Microsoft Excel - shom.xls

File Edit View Insert Format Tools Data Window Help Adobe PDF

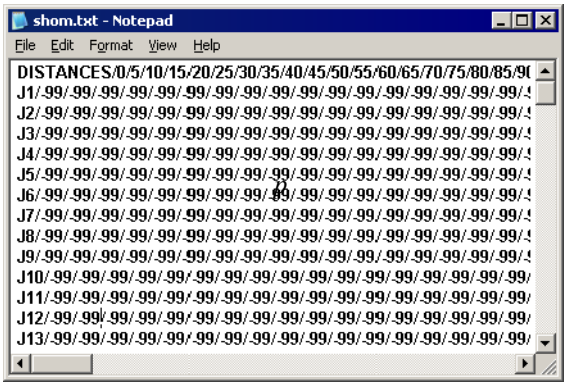
I12 fx 99

	A	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	A
1	DISTANCES	J27	J28	J29	J30	J31	J32	J33	J34	J35	J36	J37	
43	205	-17.85	-18.31	-18.37	-17.32	-18.77	-17.75	-18.77	-18.64	-17.98	-19.59	-18.90	-18
44	210	-19.69	-20.08	-20.08	-19.03	-20.31	-19.23	-20.11	-19.39	-19.19	-21.00	-21.06	-20
45	215	-21.00	99	-21.19	-21.59	-21.59	-21.78	-21.72	-21.62	-21.10	-21.95	-22.08	-21
46	220	-21.03	-17.22	-18.83	-17.81	-22.18	-22.21	-22.24	-22.08	-21.59	-22.44	-22.41	-22
47	225	-17.52	-18.37	-21.26	-19.88	-22.64	-22.38	-22.57	-22.38	-21.98	-22.70	-22.64	-22
48	230	-16.37	-16.99	-20.57	-19.75	-22.90	-22.67	-22.87	-22.77	-22.41	-23.03	-22.90	-22
49	235	-15.12	-16.99	-20.41	-16.73	-23.13	-22.83	-23.03	-22.93	-22.60	-23.26	-22.97	-22
50	240	-20.96	-16.90	-17.78	-17.49	-23.29	-22.97	-23.13	-22.90	-22.80	-23.29	-23.03	-22
51	245	-22.08	-22.31	-22.77	-22.77	-23.52	-23.03	-23.23	-22.97	-22.87	-23.33	-23.10	-23
52	250	-23.06	-23.10	-23.39	-22.90	-23.56	-23.00	-23.29	-23.00	-23.00	-23.36	-23.06	-23
53	255	-23.26	-23.23	-23.43	-23.00	-23.59	-23.10	-23.36	-23.06	-23.13	-23.43	-23.16	-23
54	260	-23.33	-23.29	-23.43	-23.03	-23.69	-23.16	-23.39	-23.13	-23.13	-23.43	-23.10	-23
55	265	-23.43	-23.33	-23.39	-23.00	-23.69	-23.16	-23.39	-23.13	-23.39	-23.49	-23.13	-23
56	270	-23.39	-23.29	-23.39	-23.16	-23.69	-23.13	-23.49	-23.16	-23.33	-23.56	-23.23	-23
57	275	-23.36	-23.20	-23.33	-23.29	-23.75	-23.20	-23.46	-23.13	-23.39	-23.56	-23.29	-23
58	280	-23.26	-23.26	-23.26	-23.23	-23.79	-23.23	-23.49	-23.20	-23.59	-23.52	-23.36	-23
59	285	-23.23	-23.26	-23.23	-23.20	-23.69	-23.20	-23.52	-23.33	-23.59	-23.52	-23.29	-23

Sheet1

Ready NUM

FIGURE 4-14. *Sample Survey Lines Text File*



shom.txt - Notepad

File Edit Format View Help

DISTANCES/0/5/10/15/20/25/30/35/40/45/50/55/60/65/70/75/80/85/9(

J1/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J2/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J3/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J4/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J5/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J6/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J7/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J8/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J9/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J10/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J11/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J12/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

J13/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/99/

NOTE: This matrix had empty cells in the top left corner so we see a lot of '99' values.

SEABED IDENTIFICATION IN MAPPER

If you have an echosounder that provides seabed identification data, you can create a Seabed Identification Square in SEABED STATISTICS then use SEABED MAPPER to:

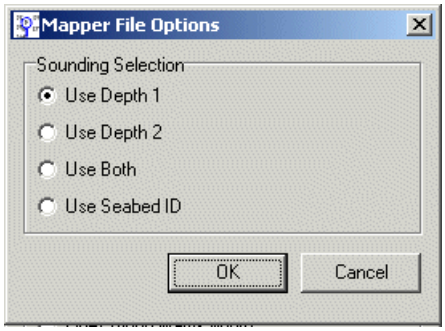
- **Map your seabed identification (seabed ID) colors into a matrix** for display in MAPPER .
- **Export an X, Y, Z, ID file**.

The interface is much the same as MAPPER, but includes the enhancements necessary for the seabed identification features.

1. **Create a Seabed Identification Square** in the SEABED STATISTICS program.

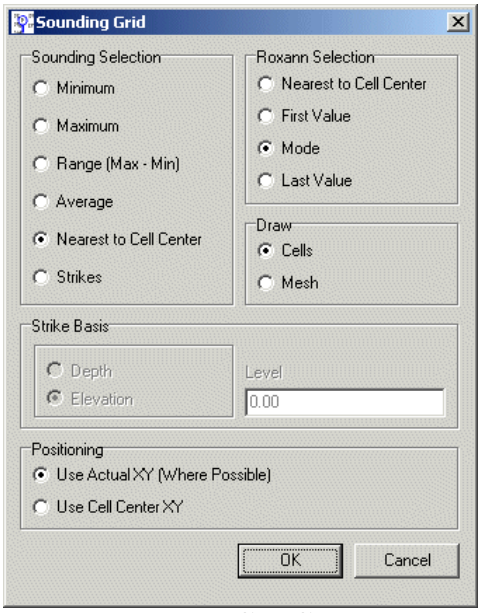
2. **Launch SEABED MAPPER** by selecting UTILITIES-SEABED-SEABED MAPPER.
3. **Load the Seabed Identification Square** by selecting FILE-OPEN SEABED ID SQUARE.
4. **Open your Matrix file and, if it is a filled matrix, the data that should be included.** Set:
   - Load Soundings from Matrix = No
   - Add Soundings to Matrix = Yes and click [Update with Catalog File] to select your files that include the seabed identification information.
5. **If you have opened an empty matrix, load your soundings** by selecting FILE-LOAD SOUNDINGS and choosing your files that include the seabed identification information.
6. **Set your file options.** SEABED MAPPER includes an additional "Use Seabed ID" option. This tells the program to fill the matrix with seabed ID colors based on the seabed ID information in each record and your seabed ID square, rather than with depth data.

FIGURE 4-15. *SEABED MAPPER File Options*



7. **Set your data selection options**.

FIGURE 4-16. *Data Selection Options*



- **Nearest to Cell Center**
- **First Value** in the file positioned in each matrix cell.
- **Last Value** in the file positioned in each matrix cell.
- **Mode** colors the cell according to the Seabed ID that occurs most often within the cell.

8. **Save your results**. SEABED MAPPER can store data in:
   - **Matrix files filled with seabed identification colors**. These can be displayed in the HYPACK® window by:
     i. Enabling them in the project files list.
     i. Setting HYPACK® to display seabed identification colors.
     ii. Loading the correct seabed identification square in the Soundings Tab of the HYPACK® Control Panel.
   - **X, Y, Z, ID files:** These files can be used as the input file in TIN MODEL to model the seabed types in the terrain. and export matrix files and DXF files color-coded with seabed ID colors. TIN MODEL uses the seabed ID to color the model.

SORT PROGRAM

This program was originally designed for cartographic selection. It reads ALL format files, from the SINGLE BEAM EDITOR program, or XYZ format files and saves the final results to an ASCII XYZ file. For each ALL format file in a Catalog file, the Sort program goes through the data and looks for the minimum sounding. It saves this to a temporary file and eliminates any data point that is within a user-specified distance of the point. It then repeats the process, saving the minimum available sounding and eliminating any soundings within a certain distance, until all the points in the file have been saved to the temporary file or eliminated.

It repeats this process for all of the files in the Catalog file, saving all of the minimum depths to the same temporary file. Upon completion, it goes through the same process with the temporary file to eliminate any possible overlaps between survey lines. It then writes the final set of minimum soundings to an ASCII XYZ file.

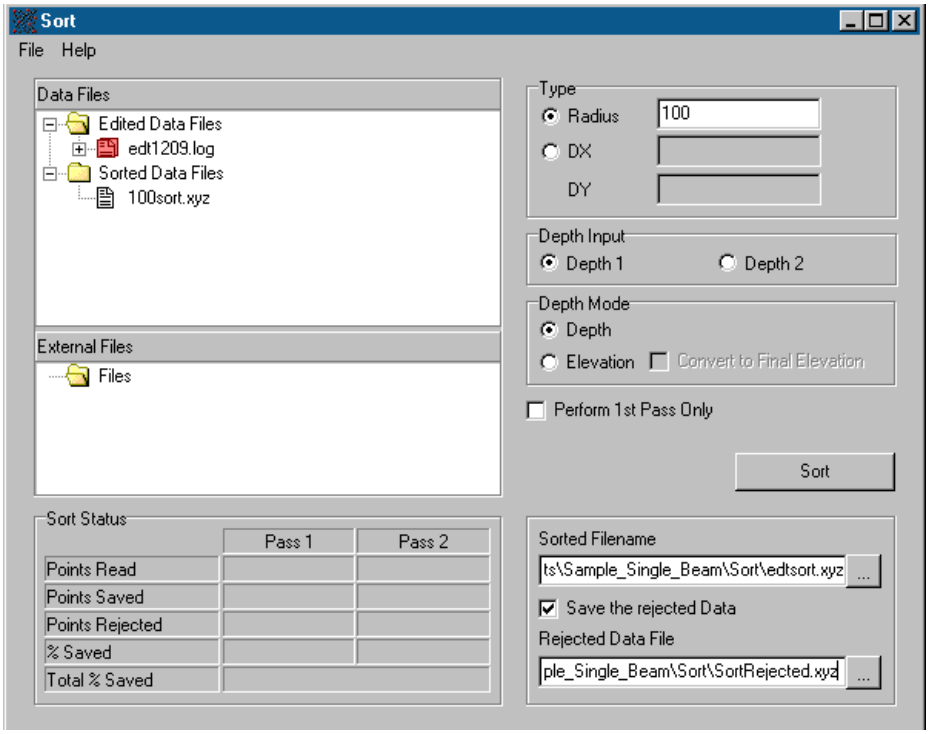
TABLE 4-1. *Advantages and Disadvantages of Sort*

Advantages to SORT	• It guarantees the minimum soundings will be placed on the smooth sheet at their proper locations.
Disadvantages to SORT	• It is slow. • It does not place soundings as an eye-pleasing constant interval.

To run the SORT program:

1. **Start the SORT program** by selecting PROCESSING-SOUNDING SELECTION-SORT from the menu bar.

FIGURE 4-1. *The Main Window of SORT*



2. **Enter specifications for the sort process**.
   - **Input File:** SORT supports any of the following file types:
     - **All format:** You can load one or more All format individual data files, or a Catalog File (*.LOG) of All format data.
     - **XYZ**

     All data files are listed in the 'Data Files' display. Those that are 'enabled' in the list will be included in the sort. **To toggle the enable status for each file** right-click on it then check or uncheck the enable option.
   - **Radius or X,Y distances** are the basis for the SORT program to eliminate conflicting data points. Select the sort type and specify the Protection Values.
     - In a **Radius** type sort, the program eliminates any other data record that is within the radial distance of the accepted point.
     - In the **XY** type sort, it eliminates any point that is closer in Easting than the DX distance or closer in Northing than the DY distance**.**

Normally, Radius is preferred. DX-DY is preferable if you have long numbers, such as magnetometer data where you want to protect a larger direction in one axis than the other.

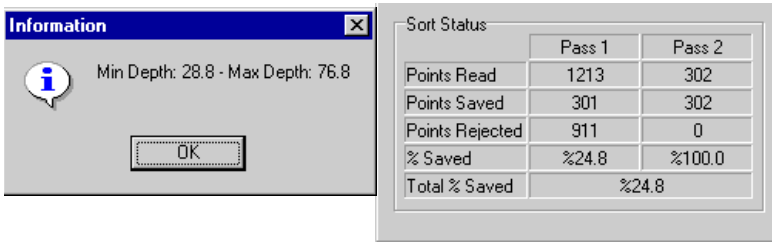
   - The **Depth Input** can either be Hi Frequency (Depth 1) or Low Frequency (Depth 2).
   - **Depth Mode:** Enter whether you are in depth or elevation mode. This assures that Sort will always output the minimum depths. In

elevation mode, **Convert to Final Elevation** may be selected to record the Chart Datum Level minus Final Depth

- **Sorted File Name:** Click the [...] and enter a name for the output file. The SORT program will write an ASCII XYZ output file to the Sort folder.
- **Rejected Data File:** In addition to the sorted file, you can also save the "rejected" soundings to a second "*.XYZ" file. This is useful where you want to have the final sorted soundings in one CAD layer and the surrounding soundings (rejected data) on a second layer.

3. **Begin the sort process** by clicking [Sort]. During the first pass, it goes through all of the data files and saves all of the minimum soundings to a temporary file. During the second pass, it then sorts the temporary file. Upon completion, it shows the Minimum and Maximum Depths encountered during the sorting process and statistics about the sorting of your data.

FIGURE 4-2. Statistics of the Sort



CROSS SORT PROGRAM

The CROSS SORT program can sort a single set or two sets of catalog files. It was originally intended for use where a set of cross check lines was to be combined with normal survey lines. Precedence would be given to the cross check lines where the two sets of data overlapped. People liked the result so much that they asked us to change the program so single catalog files (no cross check lines) could be run through CROSS SORT. So we did.

The CROSS SORT program requires a plotting sheet. It also requires you to input a size for the plotted soundings. This defaults to 2mm. The plotting sheet is sub-divided into cells just larger than the sounding size. First, it goes through the catalog file that you have given priority. It finds the minimum depth in the file and protects it. It flags the cell of the plotting sheet overlay that this cell has been filled, and no other data can fill it. It, then, goes through all of the data in the file, packing the soundings into cells until they are filled and ignoring other soundings in each cell.

The process is repeated for the rest of the files in the catalog. If there is a second catalog, the process is then repeated for that set of files. The results are saved to a sorted ALL format file.

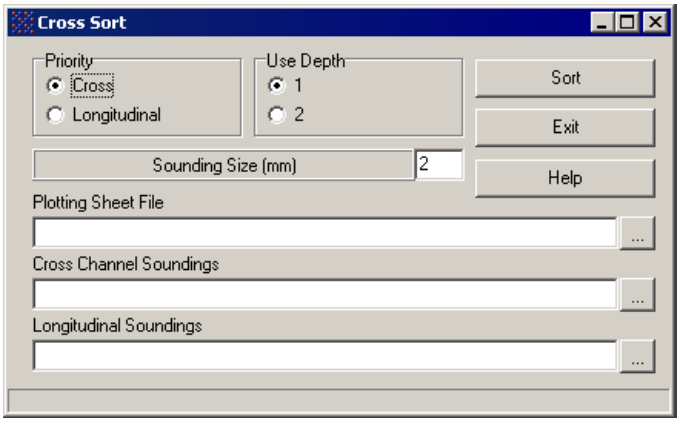
NOTE Your survey units in the Geodetic Parameters must be either meters or US Survey Feet.

Advantages of CROSS SORT	• It is fast. • It creates a file that is pleasing to the eye.
Disadvantages of CROSS SORT	• You may not have every shoal sounding represented in the data.

To run CROSS SORT:

1. **Check for a plotting sheet file** (*.PLT). You will need one for the CROSS SORT program.
2. **Begin the CROSS SORT program** by selecting PROCESSING-SOUNDING SELECTION-CROSS SORT.

FIGURE 4-1. *The CROSS SORT Window*



3. **Select your Plotting Sheet.** Click in the PLT File box and then on [...]. Select the desired Plotting Sheet file.
4. **Select your Catalog File** with your cross check lines by clicking in the Cross Channel Soundings box and [...]. You can now select the correct Catalog file. It should be the edited data file.
5. **Select your Catalog file** with your edited Normal survey lines by clicking on the Longitudinal Soundings box and [...]. Select the correct Catalog file.
6. **Specify whether you want the Cross or Longitudinal soundings to have priority** where they intersect.

NOTE If you only have one catalog file and do not have cross checks, place it in the Cross Channel Soundings box and make sure you give it priority by clicking on the Cross priority button.

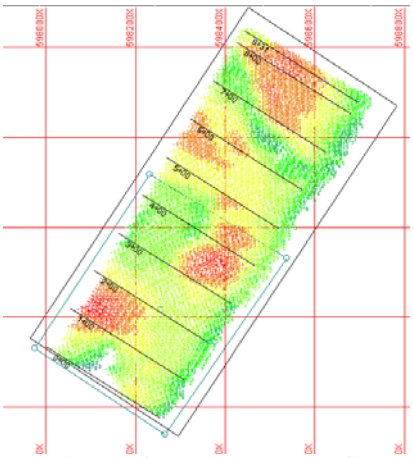
7. **Set your sounding size** if you want something other than the default 2mm.
8. **Click [OK]** to run the sort. The program goes through all of your Catalog files. It creates a new ALL format data file for each of your original Edited data files in the current Sort directory. These files contain only the final sounding you wish to have plotted.

CLIPPING SURVEY FILES

You can clip sorted XYZ files to fit an area defined by a Border File.

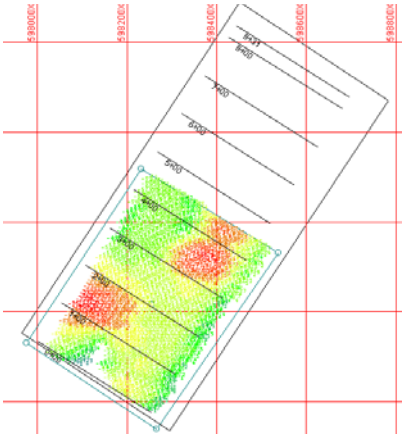
1. **Create a Border File that outlines the area you want to work with**. In this example, we will include lines 0 to 4.

FIGURE 4-1. *Clipping XYZ files with a Border File (Before)*



2. **Right click on the XYZ file you wish to clip and select CLIP TO BORDER FILE**. A file selection dialog will appear.
3. **Select your Border File**.
4. **Name your clipped survey file.** The file will be saved with an XYZ extension to your Sort directory and added to your available data files list.

FIGURE 4-2. *Clipping XYZ files with a Border File (After)*



CHAPTER 5

Side Scan Processing

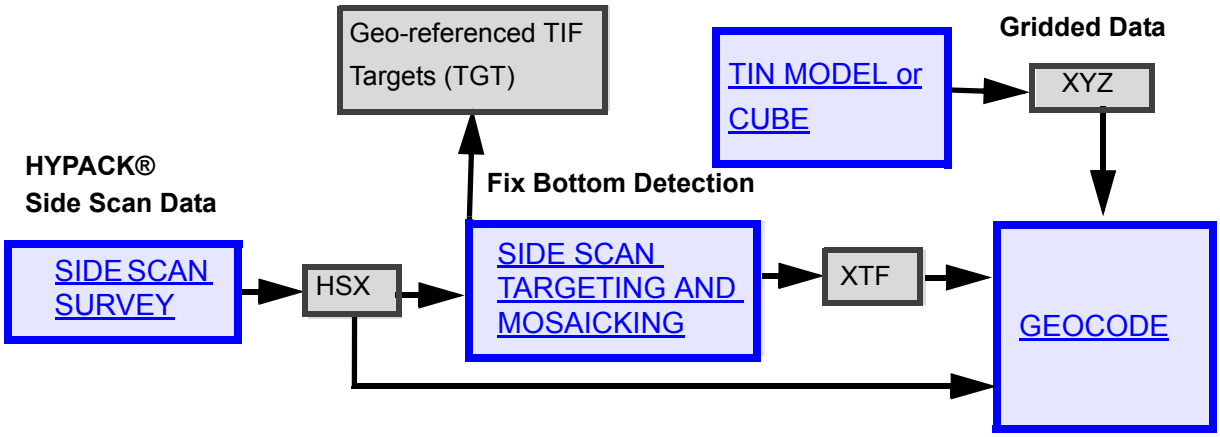
HYPACK® provides a utility, the SIDE SCAN REFORMATTER, which converts third-party side scan data to HYPACK® HSX format.

It also includes two programs that may be used to process and mosaic HYPACK® side scan data. Each has its advantages.

- **SIDE SCAN TARGETING AND MOSAICKING** provides better tools for bottom-tracking and heading. The resulting mosaics are better because the water column is more accurately removed. This program also provides targeting tools. This module reads only side scan data.
- **GEOCODER™** reads HYPACK® as well as 3rd party XTF files and has more advanced corrections settings. It can also generate mosaics from multibeam backscatter and snippet data.

If you are processing HYPACK® side scan data, you can take advantage of the strengths of each program by using SIDE SCAN TARGETING AND MOSAICKING to do bottom-tracking and targeting, then loading the resulting XTF files to GEOCODER™ to generate the mosaic.

FIGURE 5-1. *Processing Side Scan Data*



SIDE SCAN DATA REFORMATTER

The SIDE SCAN DATA REFORMATTER converts side scan data between third-party formats and the HYPACK® HSX format. These conversions enable data sharing between HYPACK® and other side scan packages.

The following conversions are supported by the SIDE SCAN DATA REFORMATTER:

- Most third-party side scan formats to HYPACK® HSX

The SIDE SCAN DATA REFORMATTER also provides some tools with which you may do some examination of XTF records and make small adjustments.

CONVERTING SIDE SCAN DATA TO HSX FORMAT

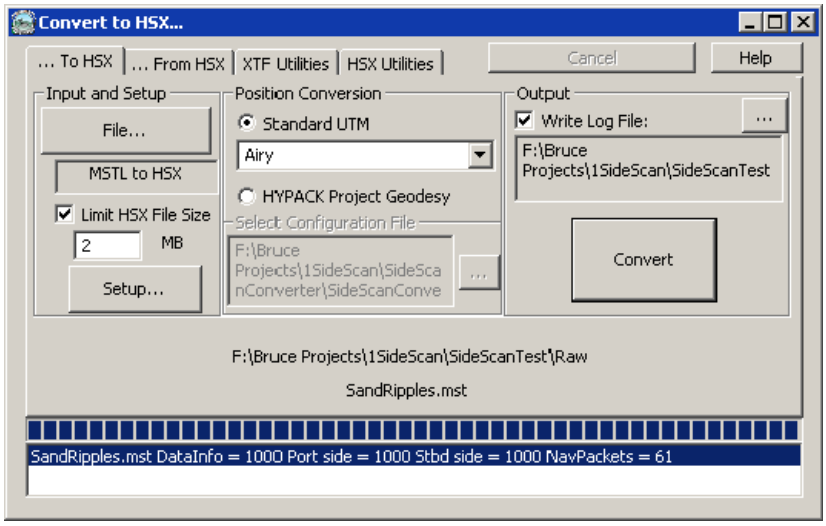
Conversion to HYPACK® HSX format enables you to load your side scan data to the HYPACK® SIDE SCAN MOSAIC program, even though you may have collected it using another tool. The program accepts:

- **ALL:** Simrad EM3000, 3002, 710 models
- **81s:** Imagenex Sportscan side scan
- **83p:** Imagenex Delta T bathymetry
- **CM2:** CMAX side scan
- **GSF:** Generic Sensor Format
- **IMG:** Applied Signal Data Files
- **JSF:** Edgetech JStar side scan
- **MSTL:** Marine Sonic side scan
- **SDF:** Klein 3000 side scan and bathymetry
- **XSE:** Elac Hydrostar files
- **XTF:** Benthos C3D bathymetry
- **XTF**: Qincy QPS bathymetry
- **XTF**: Reson or Odom bathymetry

Once the data is converted, processing in the HYSWEEP® EDITOR and SIDE SCAN MOSAIC is no different than using a file collected in HYPACK®.

1. **Launch the program by selecting SIDE SCAN – SIDE SCAN DATA REFORMATTER.**
2. **Select the '…To HSX' tab.**

FIGURE 5-2. *Sample Conversion in the SIDE SCAN DATA REFORMATTER*



3. **Click [File…] and select your raw data files.** If you have multiple files, you can load them together by selecting multiple files in the File Select dialog.

NOTE: You may have to select your file of type before your files will appear for selection.

4. **Configure your conversion.**
   - **To instruct the program to generate a catalog file that includes all of the output files**, check the **Write Log File** option. Name the Log file by clicking the […] and entering a name.
   - **Set your Position Conversion.** You can select:
     - **Standard UTM** and choose any zone from the list.
     - **HYPACK® Project Geodesy** and select your *ProjectName*.ini to use the settings in your current project.
   - **Limit HSX File Size:** If your converted file will exceed the user-defined limit, the converter generates multiple files, each smaller than the specified limit. They will be named 'RootName.HSX, RootName_1.HSX, RootName_2.HSX...until all of the input data has been converted.
   - **Set device-specific options.** Click [Setup] and set the conversion options required. Not all devices require these options.
5. **Click [Convert].** The progress of the conversion is displayed in the window at the bottom of the dialog. The files generated will be saved in the same directory as the input files.

NOTES: Files that span midnight will be broken into two files at the point of midnight. The data following midnight will be saved to a file of the same name with an "_A" extension.

Dual Frequency data will be divided by frequency with "_high"

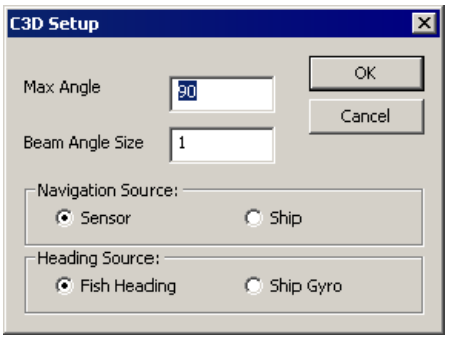
and "_low" appended.

PSI records from C3D data are used to calculated sensor depth and saved as draft in the HSX file output.

HSX Conversion Options for Benthos C3D Data

The following settings are used to convert Benthos C3D data to HYPACK® HSX format.

FIGURE 5-3. Setup to Convert Benthos C3D Data



- **Max Angle:** Set the angle of the swath from center (or half of the swath width).
- **Beam Angle Size:** Within the range defined by the Max Angle, a point will be generated at evenly spaced intervals based on this measurement.
- **For example:** If the Max Angle is 75 and the Beam Angle is 0.5, a point will be generated every 0.5 degrees from -75 to +75 off center. In this case, the total number of points generated will be 300.

  BEWARE! The HYSWEEP® EDITOR limits the beam swath to 1440 beams. Number of Beams = 2 (Max Angle)/(Beam Angle) Enter values such that number of beams ≤ 1440.

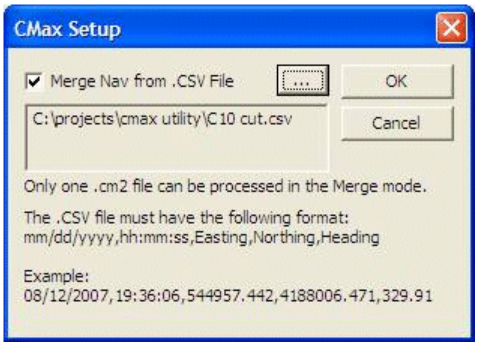
Beware!

- **Navigation Source:** The field to which position data has been saved in the output string. Most users output to the Sensor field.
- **Heading Source:** The field to which the heading is output. Most users output to the Ship Gyro field.

HSX Conversion Options for CMax CM2 Data

The following settings are used to convert CMax CM2 data to HYPACK® HSX format.

FIGURE 5-4. *Setup to Convert CMax CM2 Data*



- **Merge Navigation from CSV File** is selected if your CM2 data does not include the GPS NMEA data. Use the […] button to browse for the CSV file that corresponds to your CM2 data.

  A **CSV file** is a text file with comma delimited data in the following format: *Date, Time, Easting, Northing, Heading*

  Where: Date is expressed as mm/dd/yyyy and time is expressed as hh:mm:ss. We use the CSV extension to support files our users may generate from MicroSoft Excel spreadsheets, but you may enter any text file name in the File Select dialog.

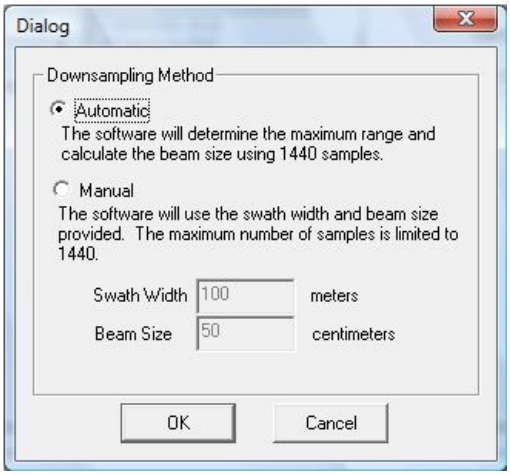
  Use the **[…]** button to browse for the CSV file that corresponds to your CM2 data.

  NOTE: When merging a CSV file, you can only do one file at a time. Select one CM2, and then one CSV file for navigation.

HSX CONVERSION OPTIONS FOR IMG DATA

The program reads the bathymetry data from the IMG records. No side scan data is recorded to your HSX data.

FIGURE 5-5. *IMG Setup Dialog*



Automatic: The program calculates the maximum range of the data and divides it into 1440 samples.

Manual: Enter your swath range and beam size.

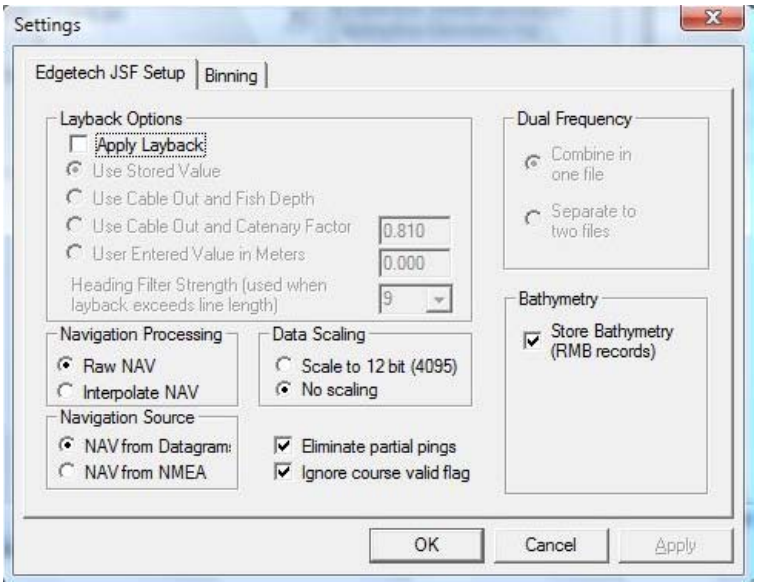
Number of beams=swath range/beam size.

NOTE: The number of beams may not exceed 1440.

HSX CONVERSION OPTIONS FOR EDGETECH JSF DATA

The following settings are used to convert Edgetech JSF data to HYPACK® HSX format.

FIGURE 5-6. *Setup to Convert Edgetech JSF Data*



The JSF setup options enable you to apply layback to your data if your device was towed.

- **Layback Options:**

  If you are towing your side scan, check the **Apply Layback** option and one of the calculation methods provided. Layback is not applicable to side-mounted side scan devices.

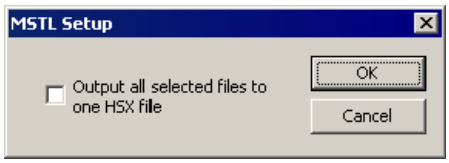
  - **Stored value** uses a layback value stored in the JSF file.
  - **Cable out and fish depth** from data uses the cable out and fish depth values from the JSF file to calculate layback
  - **Use Cable Out and Catenary Factor** uses the cable out from the JSF file and a user-defined catenary factor to calculate layback.
  - **User Entered Value in Meters** tells the program to assume a fish on the water surface at a constant, user-defined distance.
- **Heading Filter Strength:** Smoothes the heading of the towfish until the towing vessel has traveled a distance greater than the layback.

- **Navigation Processing:** The JSF sometimes skips navigation positions. The **Interpolate** option adds a position to every ping, so each position is unique for each side scan ping.
- **Data Scaling** may be used to reduce the file size of your logged data. The disadvantage is that it also decreases the resolution.
- **Dual Frequency** options provide the choice to combine the two frequencies into a single HSX file or to generate one file for each frequency.

HSX Conversion Options for Marine Sonic MSTL Data

The following settings are used to convert Marine Sonic MSTL data to HYPACK® HSX format.

FIGURE 5-7. *Setup to Convert Marine Sonic MSTL Data*

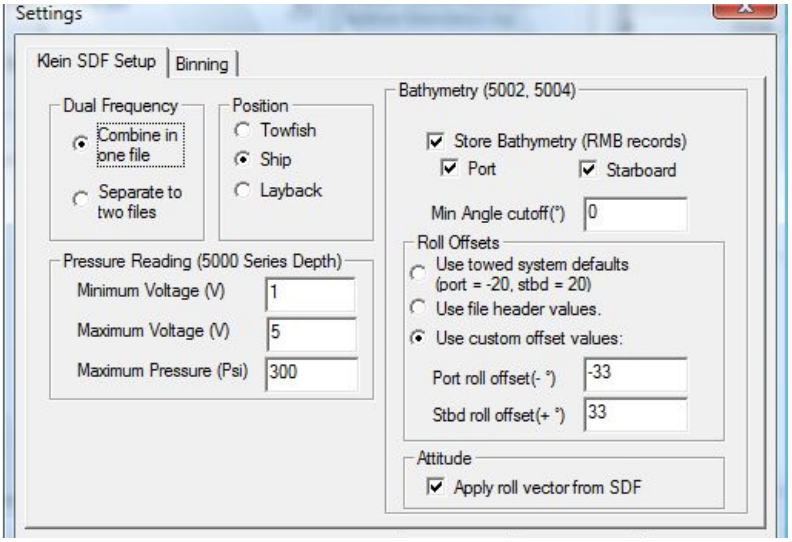


The MST purposely splits the file to 1Kb each, which generates multiple files for each line. The **Output all selected files to one HSX file** option rejoins the data in one file.

HSX Conversion Options for Klein 3000 SDF Data

The following settings are used to convert Klein 3000 SDF data to HYPACK® HSX format.

FIGURE 5-8. *Setup to Convert Klein 3000 SDF Data*



Dual Frequency options: Choose to combine the two frequencies into a single HSX file or to generate one file for each frequency.

Beware!

BEWARE! The HYSWEEP® EDITOR limits the beam swath to 1440 beams. Number of Beams = 2 (Max Angle)/(Beam Angle)
Enter values such that number of beams ≤ 1440.

Position: The field to which navigation data has been saved in the output string.

- Towfish
- Ship
- Layback

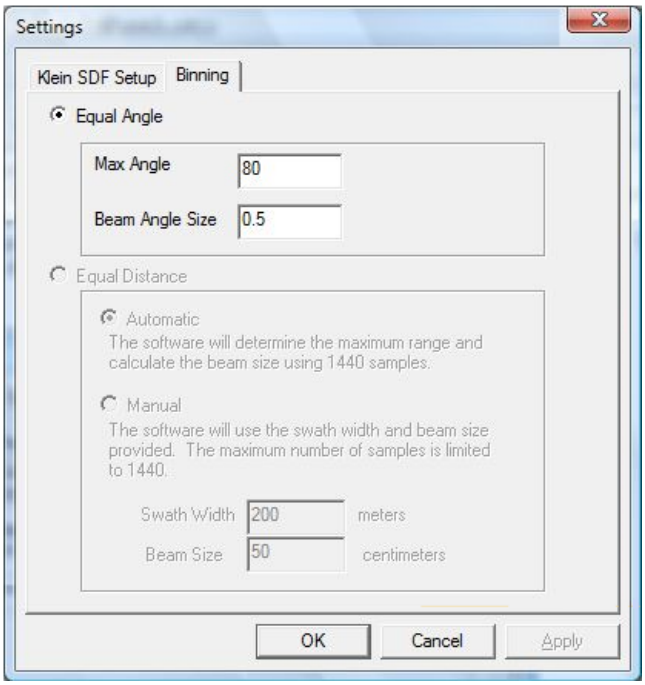
Bathymetry: If you want to store the bathymetry data, check 'Store Bathymetry' and configure the related options.

- **Port** and **Starboard** options enable you to record either side or both.
- **Minimum Angle cutoff** removes nadir region data.
- **Roll Offsets**: The declination angle of the transducers.
  - **Use towed system defaults** (port=-20, starboard=20)
  - **Use file header values** reads the offset information from the SDF file.
  - **Use custom offset values**: Define your own offsets.

  NOTE: Use negative values for the port offset.

- **Apply Roll Vector from SDF:** .

FIGURE 5-9. *SDF Setup Dialog - Bin Tab*



Equal Angle

- **Max Angle:** Data beyond this angle is not recorded.

- **Beam Angle Size**: Angle range per beam

Number of beams=Max Angle/Beam Angle Size. Multiply by 2 if you are recording both port and starboard.

Equal Distance

- **Automatic**: The program calculates the maximum range of the data and divides it into 1440 samples.
- **Manual**: Enter your swath range and beam size.

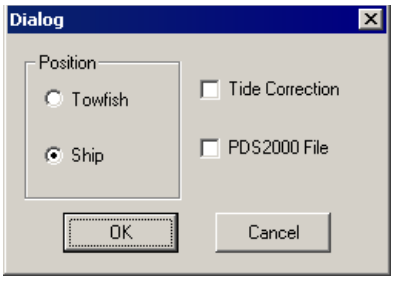
Number of beams=swath range/beam size.

NOTE: The number of beams may not exceed 1440.

HSX Conversion Options for Reson or Odom XTF Data

The following settings are used to convert Reson or Odom XTF data to HYPACK® HSX format.

FIGURE 5-10. *Setup to Convert Odom or Reson XTF data*



- **Use Tide Correction** instructs the converter to read tide information from the input file.
- **Position:** XTF files have readings from mounted sonar and towed sonar. If you have loaded an XTF file and are not getting the correct reading, select the Use Alternate Position option.
- **Ignore Count:** XTF files often have a number of records that are not part of the survey data. Input the number of records HYPACK® should ignore in each record before reading the survey information.
- **PDS2000** indicates that you are reading this type of file.

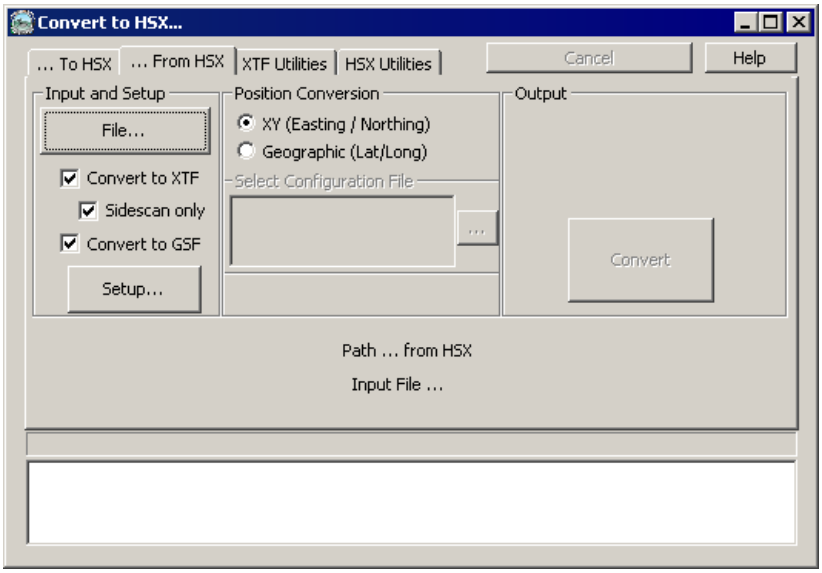
Converting from HSX

Conversions from HSX to GSF or XTF are provided at the request of some of our users to integrate HYPACK® bathymetric and side scan data with their historical data. It supports HSX data from most devices.

1. **Launch the program by selecting SIDE SCAN – SIDE SCAN DATA REFORMATTER.**

2. **Select the '…from HSX tab.**

FIGURE 5-11. *Sample Conversion in the SIDE SCAN DATA REFORMATTER*



3. **Click [File…] and select your HSX data files.** If you have multiple files, you can load them together by selecting multiple files in the File Select dialog.
4. **Choose the output file format, XTF or GSF, for the conversion.** If your input data contains both side scan and bathymetric data, the XTF output may be restricted to only the side scan data.
5. **Set your Position Conversion.**
   - **XY** reads the coordinates directly from the HSX data.
   - **Geographic** refers to your HYPACK® Project Geodesy and outputs your positions in lat./lon.. Select this option then your *ProjectName*.ini to use the geodesy in your current project.
6. **Click [Convert].** The progress of the conversion is displayed in the window at the bottom of the dialog. The files generated will be saved in the same directory as the input files.

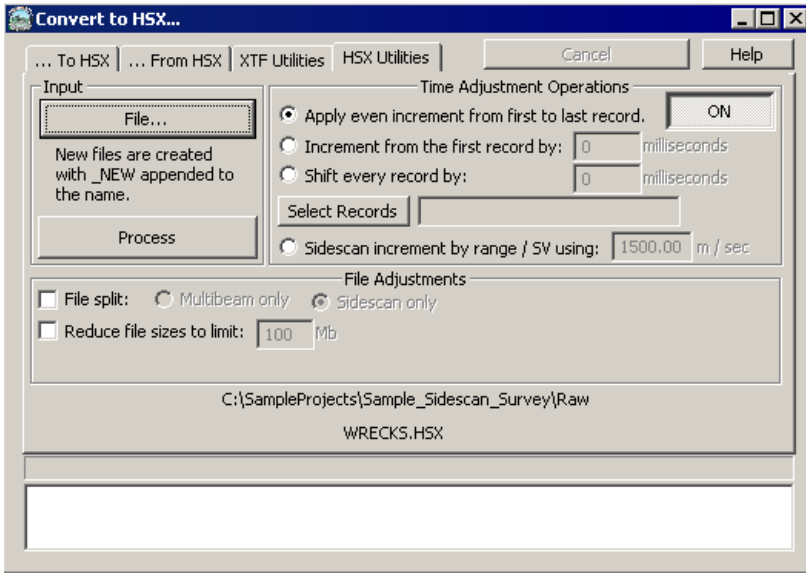
HSX UTILITIES

The HSX Utilities tab of the HSX REFORMATTER provides some tools with which you may extract subsets of your HSX data or make small timing adjustments.

This process does not overwrite the original data, but generates a new, adjusted data set with "_NEW" appended to the root filename. If more than one adjustment is performed, and additional numeric extension (ex. "_NEW_1") will prevent overwriting previous adjustmentsto the same data set.

1. **Load your input data.** Click [File] and indicate the HSX file you want to adjust. You can select either an individual HSX file or a catalog of HSX data.
2. **Enter your adjustment criteria**.

FIGURE 5-12. *HSX Utilities Tab*



- **Time Adjustment Options:** Enable the options by pressing the On/Off button, then set your criteria.
  - **Apply even increment from first to last record** calculates the time difference between the first and last record. It then counts the number of records in the file and applies evenly incremented time tags to your records.
  - **Increment from the first record by** begins with the time stamp of the first record, then increments each
  - **Shift every record by** adjusts the time on each record by a user-defined constant amount.
  - **Side scan increment by range/SV using:** This option allows you to recalculate the time interval between pings (msec) by adjusting the sound velocity using the following equation.
    Ping Interval = 1/(sound velocity/ 2(range scale))

    NOTE This option affects only RSS records.

- **File Adjustments:**
  - **File Split** takes an HSX file containing both multibeam (RMB records) and side scan (RSS records) data. It stripseither the RSS or RMB records out and saves the results to a newfile with only multibeam or side scan data respectively. The header, as well as all ancillary information

(gyro, position, etc) remains intact. The output file is named with '_MB' or' _SS' appended to the file name.

- **Reduce file sizes to limit** breaks your data file into multiple smaller segments based on a user-defined file size. For example, you can break a 50Mb file into five 10Mbfiles by checking this option and setting the limit to 10. The output file is named with '_1', '_2', '_3',...appended to the file name.

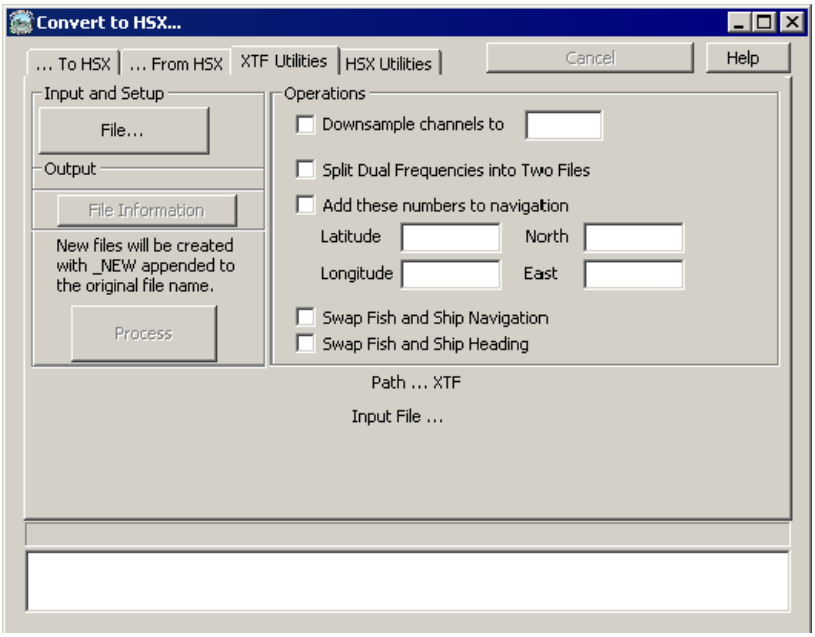
3. **If you are performing one of the first three time adjustments, define which records you want to adjust.**
   a. Click [Select Records]. A dialog listing all of the data string types in your file will appear.
   b. Select those you wish to adjust. (Hold Ctrl to select more than one type.) and click [OK].
4. **Click [Process]**. The files are saved automatically to the project Raw folder.

XTF UTILITIES

The XTF Utilities tab of the HSX REFORMATTER provides some tools with which you may do some examination of XTF records and make small adjustments.

1. **Load your input data.** Click [File] and indicate the XTF file you want to adjust.
2. **Preview data statistics** (optional) by clicking [File Information].
3. **Enter your adjustment criteria**.
   - The **Downsample channels to** option reduces your data to a user-specified number of samples per channel and saves the result to files named *RootName*_NEW.XTF
   - **Split Dual Frequencies into Two Files** generates separate files, each representing data from one frequency.
   - **The 'Add these numbers to navigation'** option shifts the vessel position by the amount entered in the lat/lon or North/East fields.
   - **Swap Fish and Ship Navigation**.
   - **Swap Fish and Ship Heading**.

FIGURE 5-13. XTF Utilities Tab



4. **Click [Process].** The files are saved automatically to the project Raw folder.

To confirm the conversion, load the converted data to the converter and compare the file information with the original information.

SIDE SCAN MOSAIC

The SIDE SCAN TARGETING AND MOSAICKING program is the side scan processing program. It reads HSX, XTF format side scan data and draws it to a series of windows ready for editing in the **Raw Data Mode**. The edited files are saved to your project's edit folder in HYPACK®'s HS2 format. SIDE SCAN MOSAIC will append "_ss" to the file name in order to distinguish edited side scan files from edited multibeam data which may be generated from the same raw data.

Scan View Mode enables you visually examine your data, one file at a time. Use the scroll bar to progress through each data set, while marking targets, making notes and taking measurements at any points of interest.

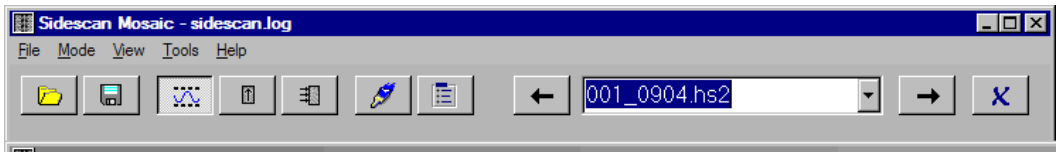
Mosaic Mode is used to convert side scan data to a mosaic. A **mosaic** is a blending of the side scan data from one or more data files. A mosaic is not a file type in itself; SIDE SCAN MOSAIC does not save mosaic files. Rather, it is the preview of your geo-referenced TIF, which can be exported from SIDE SCAN MOSAIC and displayed in your project as a

background file. These TIF files may be generated in batches using the SIDE SCAN AUTOMOSAIC program.

RUNNING SIDE SCAN MOSAIC

Launch SIDE SCAN MOSAIC by selecting SIDE SCAN -SIDE SCAN TARGETING AND MOSAICKING. The program's shell will appear.

FIGURE 5-14. *SIDE SCAN MOSAIC Shell*



The shell is used to load your data, to select the program mode and to access the Side Scan Controls.

SIDE SCAN MOSAIC has three modes.

- **In Raw Data Mode:**
  a. **Load your data and set your Read Parameters.**
  b. **Omit 'useless' lines.**
  c. **Set your view options.**
  d. **Edit your heading**.
  e. **Edit your track lines**.
  f. **Set your fish altitude**. This value is important in order to accurately remove the water column from your display and make your mosaic.
  g. **Save the edited data** to your project's Edit folder in HS2 format
- **In Scan View Mode:**
  a. **Visually inspect your files.**
  b. **Mark any targets.** (optional)
  c. **Print data.** (optional)
- **In Mosaic Mode:**
  a. **Select the files to be included in the mosaic.**
  b. **Define the mosaic construction settings**.
  c. **Build the mosaic**.
  d. **Edit out small white areas** if desired.
  e. **Save the results to TIF format**.

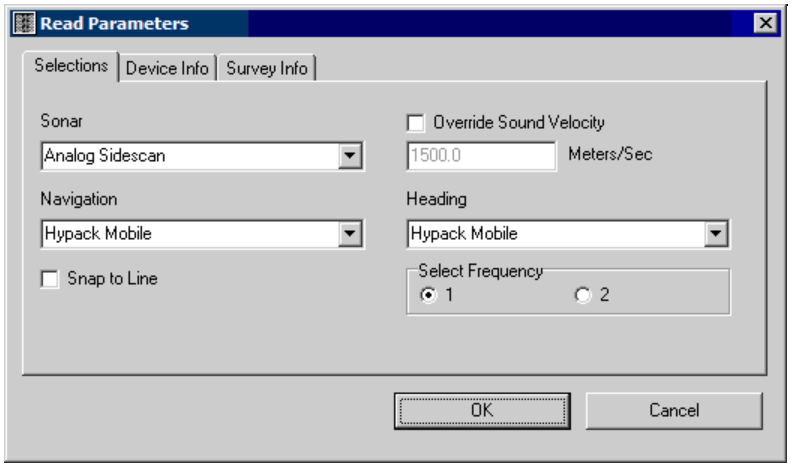
LOADING DATA TO SIDE SCAN MOSAIC

SIDE SCAN MOSAIC can draw HSX or XTF files. Select FILE-OPEN (or the File Open icon) to open one or more individual files or catalog files (*.LOG) of either of these file types.

NOTE If you collected your data with the HYPACK® SIDE SCAN SURVEY program, catalog files have been automatically be created in your Raw folder. If you have collected your data using another system, you will have to create catalog files.

Following your data selection, the Read Parameters dialog appears.

FIGURE 5-15. *Read Parameters Dialog—Selections Tab*

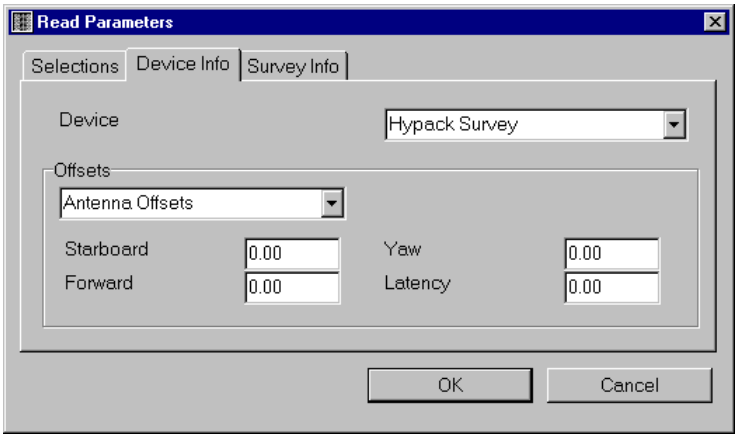


In the **Selections** tab, select a device of each type from which the program should read. For example, if your hardware configuration includes more than one position device, you must select the device from which position data will be read for your SIDE SCAN MOSAIC display. If your side scan is hull-mounted, choose your HYPACK® Navigation. If it is towed, select the HYPACK® Mobile.

If you are loading dual frequency data, select the frequency that you want to view.

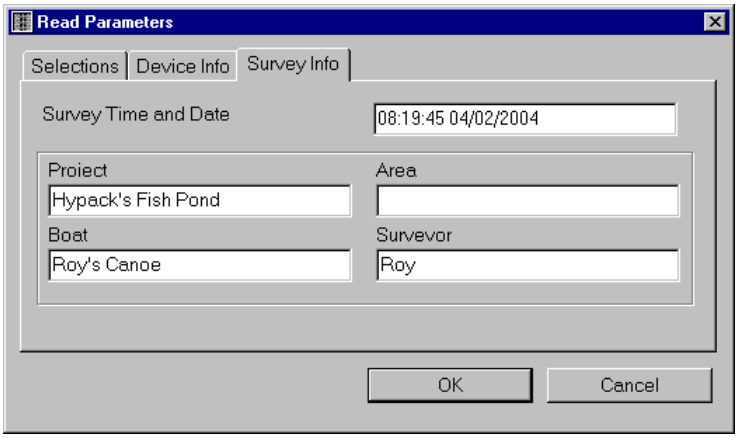
Override Sound Velocity allows you to enter a sound velocity correction value that will replace that recorded during SURVEY.

FIGURE 5-16. *Read Parameters Dialog—Device Info Tab*



The **Device Info** tab offers the opportunity to modify your device offsets. It initially displays the offsets from your hardware configuration. If you have found that any of these settings were incorrect during survey, enter the correct settings. Any modifications you make here will be reflected *only in the edited data* saved from this SIDE SCAN MOSAIC session.

FIGURE 5-17. *Read Parameters Dialog—Survey Info Tab*



The **Survey Info** tab displays the project information, if you entered any, from SURVEY. You can modify this information, if you wish, for the edited data.

When you have completed your Read Parameters settings, click [OK] and the program will automatically proceed to the Raw Data Mode.

If you have chosen an individual file, it will be listed in the drop-down box on the shell.

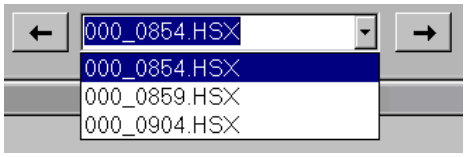
If you have chosen a LOG file, the first file in the catalog will be displayed.

To select the file drawn to the screen:

- **Scroll forward and back in the catalog** using the arrows on either side of the file list.

- **Select a file from the catalog** using the drop-down list.

FIGURE 5-18. Selecting a File



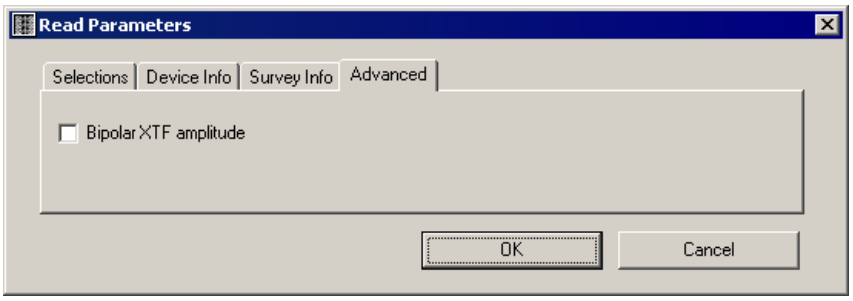
When a data file is selected, the track line and heading for the selected line will be displayed in the Heading and Track Line Editor windows respectively.

To draw the data in the Towfish Altitude window, select whether you want to view the port or starboard data and click the Draw icon. The scans are stacked in order and drawn to the right-hand side of the window to provide an image of the scanned area.

NOTE: Each time you change files or your port/starboard designation, you must click the Draw icon again to draw the new data to the Towfish Altitude window. (An auto-refresh option is in development.)

To omit lines from the mosaic, select it in the shell and click the [X] to the right of the arrow button (not the one that closes the program).

FIGURE 5-19. Read Parameters - Advanced Tab



In the Advanced tab, the Bipolar XTF amplitude option tells the program to 'zero' negative amplitudes.

IMPORTANT: This option is not retained. *You must check it each time you load such data to the program*.

More Information

- See "Catalog Files (*.LOG)" on page 1-66

SETTING SIDE SCAN MOSAIC DISPLAY OPTIONS

Side Scan Controls

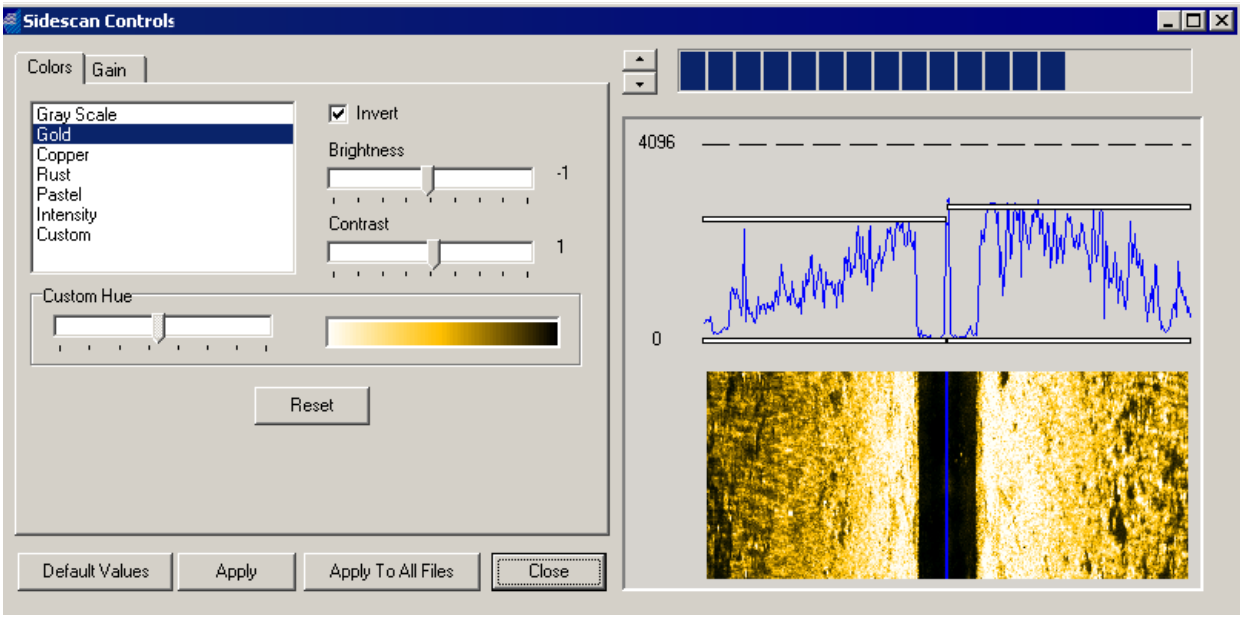
The side scan controls optimize the SIDE SCAN MOSAIC displays and control the range to be displayed and included in the mosaic and exported TIF.

To access the settings dialogs, click the Side Scan Controls icon. All functions in this dialog are the same as in SIDE SCAN SURVEY.

You can use the color preview, which is displayed with the side scan controls, to preview the effects of your display settings.

The color preview window also contains controls for adjusting contrast and brightness. The sliders above and below the signal graph set high and low color saturation limits.

FIGURE 5-20. *Color Preview*

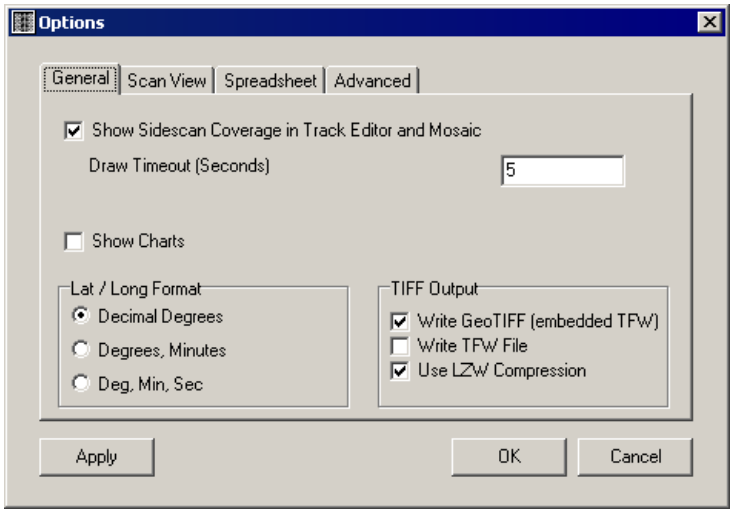


Display settings only affect the line currently displayed. Click **[Apply to all Files]** to make the settings consistent for all files in the log.

View Options Dialog- General Tab:

Additional display settings are made in the View Options dialog which may be accessed by selecting VIEW – OPTIONS (F9).

FIGURE 5-21. *Side Scan Mosaic View Options Dialog—General Tab*



Show Side Scan Coverage in Track Editor and Mosaic draws lines perpendicular to the track line to demonstrate coverage area.

Draw Timeout: If drawing the coverage lines is too slow (as with very dense data), this option omits them. If the coverage line can not be drawn within the user-specified time, it will proceed with only the track line.

Show Charts in Track, Coverage and Mosaic windows.

Lat/Lon Format determines how these grid coordinates will be displayed in the Target dialog and in the TARGET VIEWER.

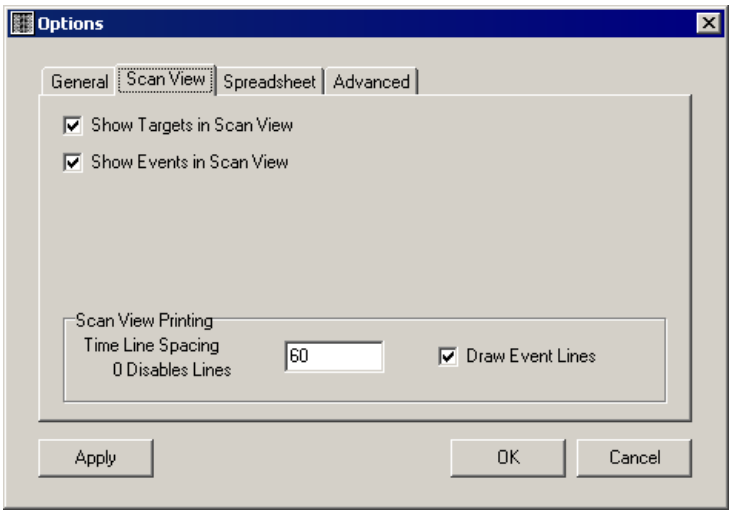
TIFF Output:

- **Write GeoTif** (embedded TFW).
- **Write TFW** file enables you to generate a separate file that contains coordinates that describe the location, scale, and rotation of the TIF. It is used by geographic information systems (GIS) software for locating areas in raster map images.
- **Use LZW Compression**: This is a lossless compression algorithm that significantly reduces the resulting file size without losing resolution of the image.

View Options Dialog- Scan View Tab

The Scan View tab includes options specific to the Scan View phase.

FIGURE 5-22. *View Options - Scan View Tab*



Show Targets in Scan View displays your targets in the in Scan View and Coverage windows.

- **In the Coverage window**, a triangle symbol with the target name (time) is displayed at the target location.
- **In the Scan View**, a square is drawn around the target area. If you have checked the 'Automatically Manage Target Files' option in the Program Options dialog, a red square marks all targets marked while viewing the current line. Targets marked while viewing overlapping lines will be blue.

Show Events in Scan View annotates the display with a horizontal line and event time.

TIP: The 'Show Targets' and 'Show Events' options are also accessible through a right-click menu from the Scan View window.

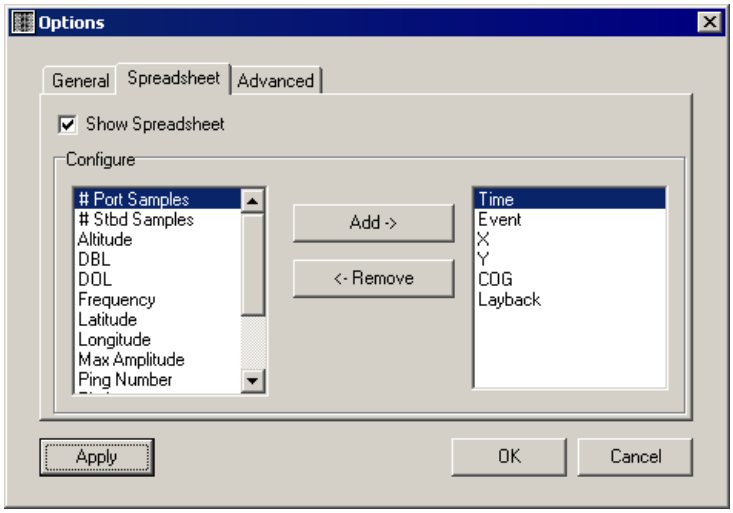
Scan View Printing Options:

- **Time Line Spacing:** Interval in seconds where annotation marks will be drawn in gray and labelled with the time.
- **Draw Event Lines:** Events are annotated in blue and labelled with *'EventNumber.Time'*.

View Options Dialog- Spreadsheet Tab:

The Spreadsheet Tab enables you to display a configurable spreadsheet window when you advance to Scan View. Each time you click in the Scan View display, the spreadsheet display automatically synchronizes and highlights the record corresponding to the click position.

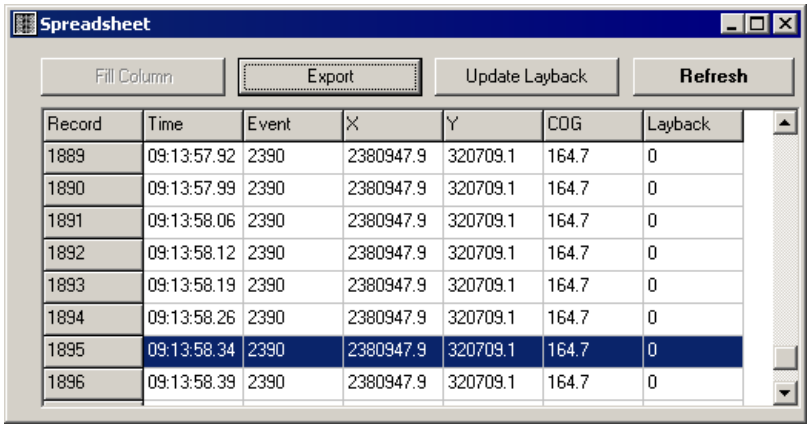
FIGURE 5-23. *Spreadsheet Tab*



Items available are listed on the left, while items selected are listed to the right. Select items in either column then use the [Add=>] and [<=Remove] to include or omit them from your spreadsheet display..

NOTE: The list of items available is maintained in alphabetical order. The list of items selected shows the order that the columns will be displayed in the spreadsheet. Normally, they will be listed in the order that they are selected. However, if you wish to insert a column in the middle of the list, select the item in the selected items list that you wish your new selection to follow. The next added items will be inserted there.

FIGURE 5-24. *Spreadsheet Window*

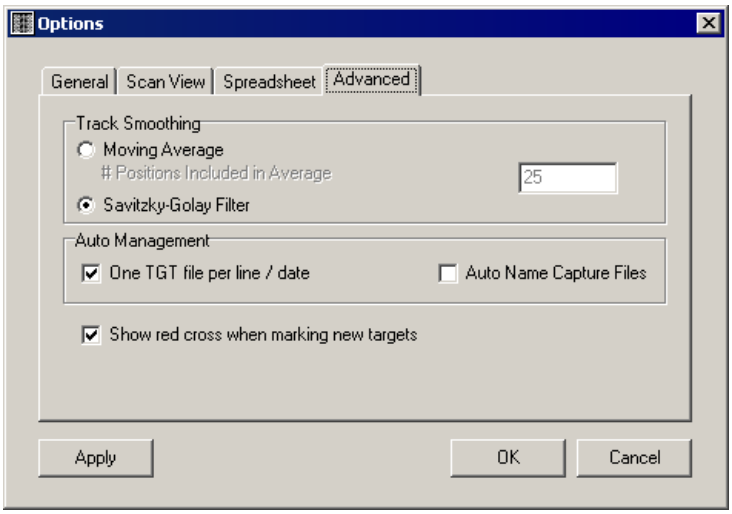


Record	Time	Event	X	Y	COG	Layback
1889	09:13:57.92	2390	2380947.9	320709.1	164.7	0
1890	09:13:57.99	2390	2380947.9	320709.1	164.7	0
1891	09:13:58.06	2390	2380947.9	320709.1	164.7	0
1892	09:13:58.12	2390	2380947.9	320709.1	164.7	0
1893	09:13:58.19	2390	2380947.9	320709.1	164.7	0
1894	09:13:58.26	2390	2380947.9	320709.1	164.7	0
1895	09:13:58.34	2390	2380947.9	320709.1	164.7	0
1896	09:13:58.39	2390	2380947.9	320709.1	164.7	0

View Options Dialog- Advanced Tab:

The Advanced tab contains options that do not exactly affect the display. These options are described with the procedures they affect.

FIGURE 5-25. *View Options - Advanced Tab*



Track Smoothing Options:

- Moving Average
- Savitsky-Golay Filter

Auto Management:

- **One Target File Per Line/Date** determines how each target will be saved.

TABLE 5-1. *Target AutoManagement Save Option.*

Program Option 'One TGT per line /date' Checked?	Target Save Routine
Yes	The program will automatically append each target to two target files; one target file for the current line and one target file for the survey date. For example, a target created in line 005_0920_ss1.hs2 that was surveyed on November 8, 2004 is saved to 005_0920_ss1.tgt and 11082004.tgt. The target itself is named using the time that location was surveyed.
No	If this is the first target in a session, a File Save dialog will appear for you to name your target file. You can do either of the following: • **Create a new Target file** by entering a new file name. • **Select an existing Target file**, the current target will be appended to the selected file. The file will not be overwritten. Subsequent targets will automatically be saved to this target file until you leave SIDE SCAN MOSAIC.

- **AutoName Capture Files:** When this is checked, targets are automatically named with the time associated with that position in the survey data.

Show Red Cross When Marking New Targets: A red '+' will appear at the target location in the Target Viewer.

More Information

- "Side Scan Color Controls" on page 3-93
- "Editing Track Lines in Side Scan Mosaic" on page 5-24
- "Marking Targets in Scan View" on page 5-30
- "Screen Captures in Scan View" on page 5-34
- "Reviewing Targets in the TARGET VIEWER" on page 5-34
- "Printing the Scan View Image" on page 5-37

EDITING YOUR SIDE SCAN DATA

There are three parts to editing side scan data. You can edit:

- **Track Lines** to remove position spikes by smoothing the track line or by deleting one or more segments from the defined track..
- **Heading:** You can smooth or manually define the heading for the entire length of the line or for one or more user-defined segments of it.
- **Towfish Altitude** to smooth and vertically adjust the altitude of the line or segments of it, and remove the water column to allow the targeting in Scan View to be properly geo-referenced.

Each time you smooth the line in any of the three windows, the counter in the status bar of that window increments. This count is maintained only for the current session. A similar count is maintained for each vertical adjustment in the Towfish Altitude window.

When your track lines and heading are edited, and you have a satisfactory towfish altitude defined, click the Scan View icon to progress to Scan View Mode.

Edited Side Scan data is saved to HS2 format with an "_ss" appended to the filename (ex.000_0904_ss.hs2), which distinguishes them from multibeam data (000_0904.hs2) that may be derived from the same raw data.

In Scan View, you can also edit layback and sound velocity.

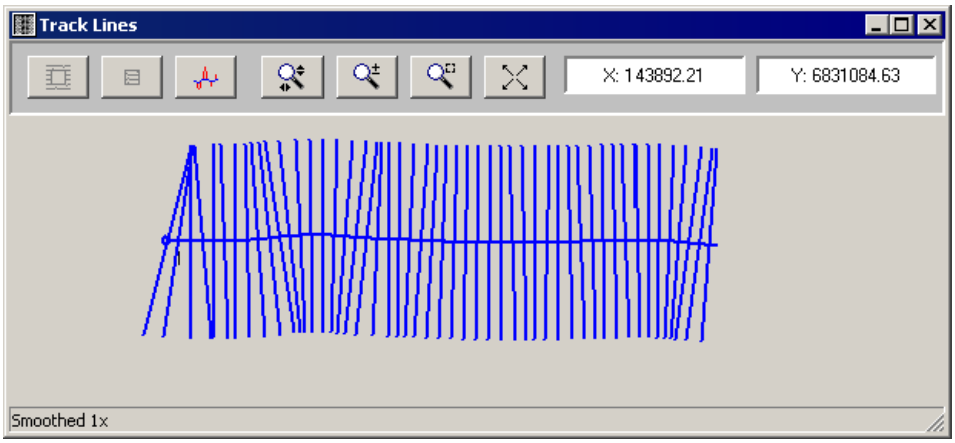
More Information

- "Editing Layback and Sound Velocity in Side Scan Mosaic" on page 5-29

EDITING TRACK LINES IN SIDE SCAN MOSAIC

The Track Line Editor displays the track lines and coverage of all loaded files. The line currently selected in the shell is blue, while the remaining tracks are gray. Use the zoom and pan tools to optimize your view.

FIGURE 5-26. *Track Line Editor*



In the Track Line Editor, you can remove position spikes and smooth your tracklines.

To remove portions of the track lines:

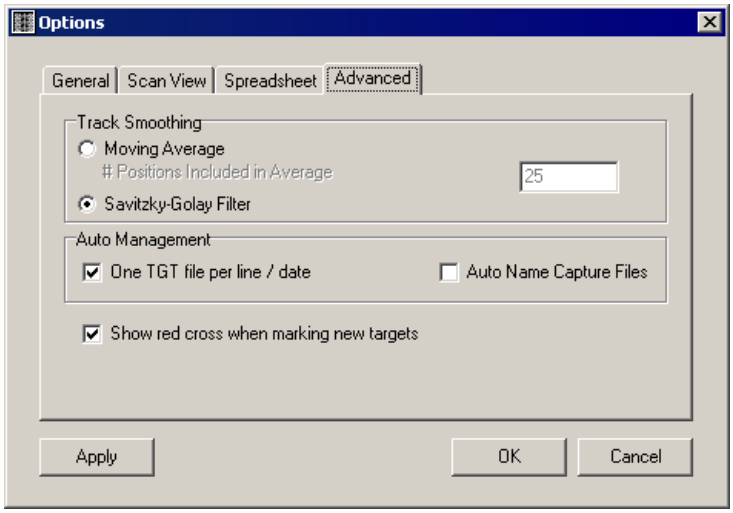
1. **Use your mouse to drag a box around your data.**
2. **Click the Delete In/Out buttons** to remove data where the tracks fall inside/outside the box.

If you remove a portion of the track line that does not include an end point, the program assumes a straight track across the space.

To smooth your track lines:

1. **Set your smoothing options**.
   a. **Select VIEW- OPTIONS** (F9).

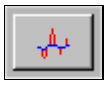
FIGURE 5-27. *Track Smoothing Options*



b. **Select your smoothing option and click [OK].** There are two Track Smoothing options:

- **Moving Average** (recommended) doesn't respond to small changes in heading. It does a great job of smoothing, although fine direction changes may be lost.
- **Savitzky-Golay Filter** is more appropriate for a boat than a towfish.

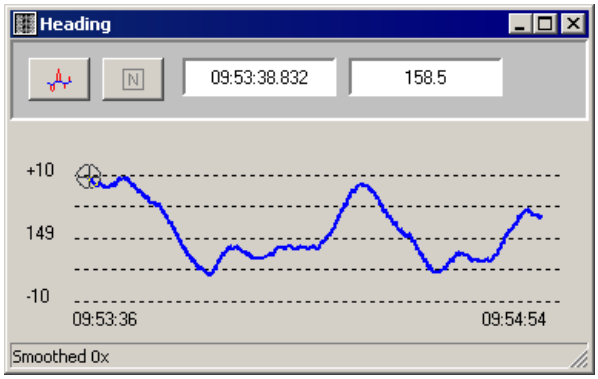
2. **If you want to smooth only a portion of the line, use your cursor to drag a box** around the portion to be smoothed.
3. **Click the Smooth icon** in the Track Line Editor. This is an all or nothing operation. The entire track line of all loaded files will be smoothed.



EDITING HEADING IN SIDE SCAN MOSAIC

Minute changes in towfish heading seem to be exaggerated when we stack the scans to create the mosaic. Smoothing the heading improves the quality of the mosaic.

FIGURE 5-28. *Sample Heading Window*



You can smooth the entire line with just one click of the smoothing icon or drag your cursor across a range in the Heading window to define the segment of the line that will be smoothed.

You can also manually enter a heading value for the line, or for one or more segments of the line.

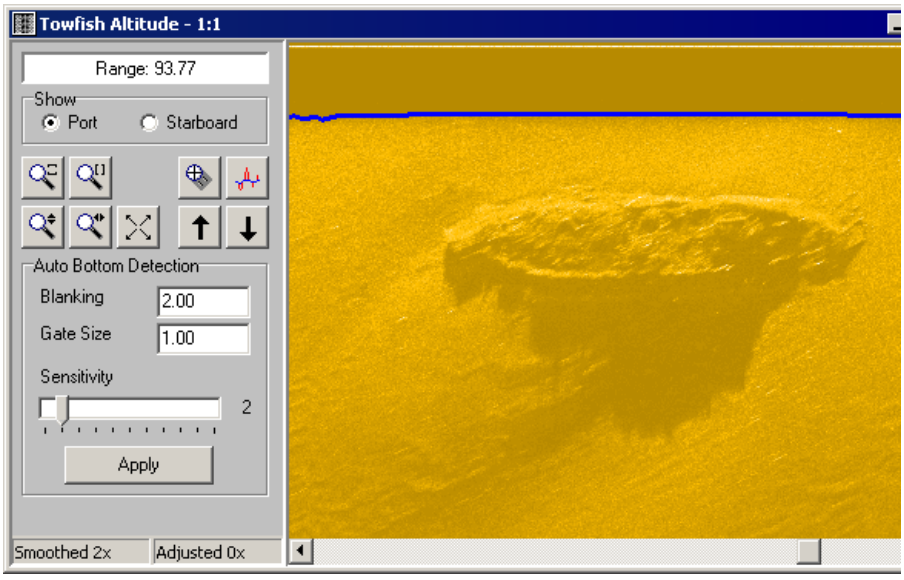
1. **Use the cursor to draw a box around the segment (any portion including the entire line) for which you want to define the heading**.
2. **Click the 'Fill' icon.** A dialog will appear..
3. **Enter the new heading value and click [OK].** The defined heading will be applied to all data within the defined area.

TOWFISH ALTITUDE IN SIDE SCAN MOSAIC

Determining the fish altitude is important to be able to accurately remove the water column before creating your mosaic.

Some side scan devices have an altitude sensor and the fish altitude is recorded in the data files. It is wise to check these values for unlikely spikes and smooth them out. Other devices do not include altitude sensors and we must create fish altitude records based on the sounding data.

FIGURE 5-29. *Sample Towfish Altitude Window*



The towfish altitude is indicated by the blue line in the Towfish Altitude window. The initial altitude is from the towfish altitude sensor, if you have one. Otherwise, it is based on a bottom detection algorithm from SURVEY.

Beware!

BEWARE! *Failure to remove the water column will result in a dark strip down the TIF which will affect the accuracy of the geo-referencing.*

To optimize your view:

Zoom tools are provided to change the horizontal and vertical zoom scale of your data.

Icon	Function
Horizontal Zoom In	Reduces downsampling for display purposes, which increases the resolution but displays less of the line at once.
Horizontal Zoom Out	Increases downsampling for display purposes, which reduces the resolution but displays more data at once..
Vertical Zoom In	Click the icon, then drag your cursor vertically across the data to define the display range.
Vertical Zoom Out	Shows full vertical range of your data.
Zoom Extents	Downsamples enough to display the full data set in the window.

To establish towfish altitude:

- **Auto-Bottom Detection:** This method works particularly well where there is little noise in the water column and the initial bottom returns are strong. Three parameters control auto detection.
  - **Blanking** is a minimum altitude value where zero provides no bottom tracking and a very high setting can set the bottom tracking at a depth greater than the true depth. A low value of 5-10 feet will usually improve the detection process.
  - **Gate Size** is the maximum expected change in towfish altitude. Altitude points outside the gate are rejected unless there are many of them.
  - **Sensitivity** affects how receptive the tracking is to changes in the water column. Increase sensitivity if altitude detection is beyond the end of the water column. Decrease sensitivity if water column noise (usually aeration) is consistently mistaken as the bottom.

  [Apply] activates the auto-detection.
- **Digitizing:** Manually mark the towfish altitude using your mouse on the side scan record.
  a. **Click the digitize button** to activate digitize mode
  b. **Use the mouse to digitize points** from left to right across the side scan record. Your marks will appear as red dots.
  c. **Click the digitize button** again to apply the digitized altitude.

Once the altitude is established you can further improve the fit of the profile to your data by making vertical adjustments, smoothing or both.

Adjust the defined altitude profile using the arrow buttons. Each click raises or lowers the profile by 1 percent.

Smoothing rounds sharp angles in the profile.

NOTE: You can confine the auto-detection, adjustment or smoothing to a select segment of the line by dragging a box around the data before clicking the corresponding icon or [Apply].

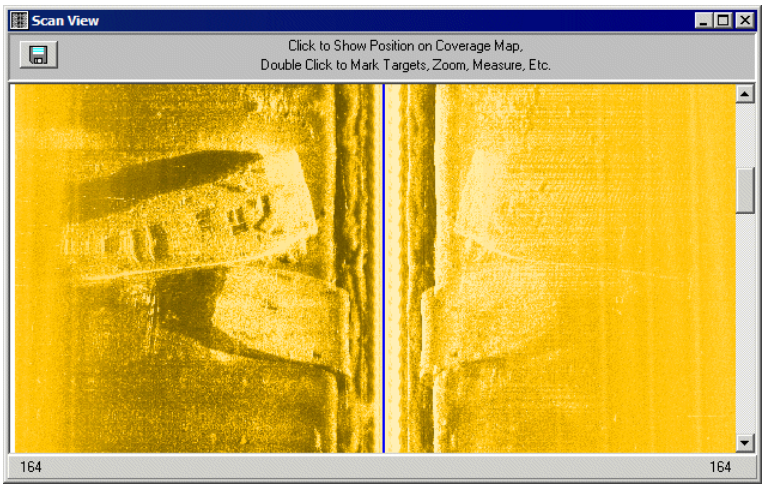
The status bar displays a count of times you have smoothed the full line of data *during the current session*.

SCAN VIEW

To access Scan View Mode, click the Scan View Icon in the SIDE SCAN MOSAIC shell. Click the Draw icon so the data will be drawn in the display area of Scan View. Use the sliders on the right to scroll through your data file.

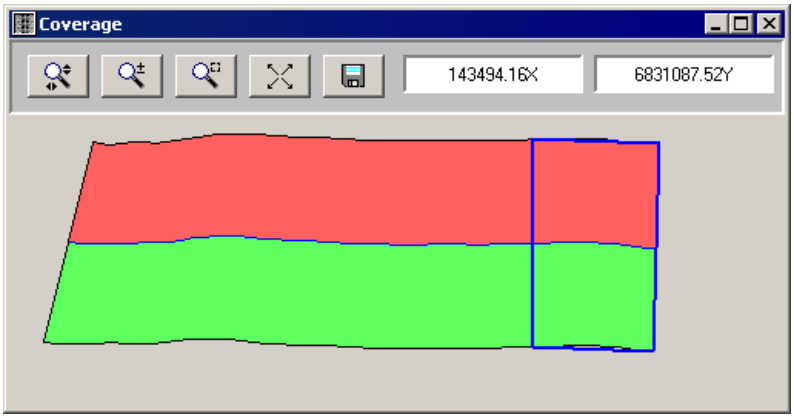
In Scan View, you can visually examine your side scan data. Double-click at places of interest to mark targets and make measurements. You can save graphic files of defined areas in your scan. The View Options (F9) provide the choice to display targets and event marks in the Scan View.

FIGURE 5-30. *Side Scan Data in Scan View*



The Coverage window displays an outline of the scanned area with starboard scans in red and port scans in green. A blue border defines the area currently in view in the Scan View window.

FIGURE 5-31. Side Scan Coverage Window



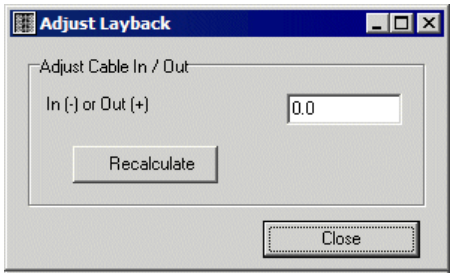
Using the **View Options** (F9), you can opt to also display background charts, and targets to help locate the features seen in the Scan View. The **Side Scan Controls** (Shift+F9) enable you to remove the water column, add scale lines or modify the display range.

EDITING LAYBACK AND SOUND VELOCITY IN SIDE SCAN MOSAIC

Layback and Sound Velocity are the only editable values in the Spreadsheet window.

- **Type new values into individual cells** or
- **Reset one or more contiguous cells at the end of the line to the same value** by changing the first value in the series and clicking [Fill Column]. If you start with the first cell, all cells in the column will be the same.
- **Adjust Layback by a constant amount:**
  a. **Select TOOLS-ADJUST LAYBACK**. A dialog will appear.

FIGURE 5-32. Adjust Layback Dialog



b. **Enter your new Cable Out value and click [Recalculate]**. The program will tell you when the calculations are complete.
c. **Click [OK].** The Adjust Layback dialog will close.

To see the results in the Coverage Map window, use one of the icons in the Coverage Map window to cause the display to redraw.

MARKING TARGETS IN SCAN VIEW

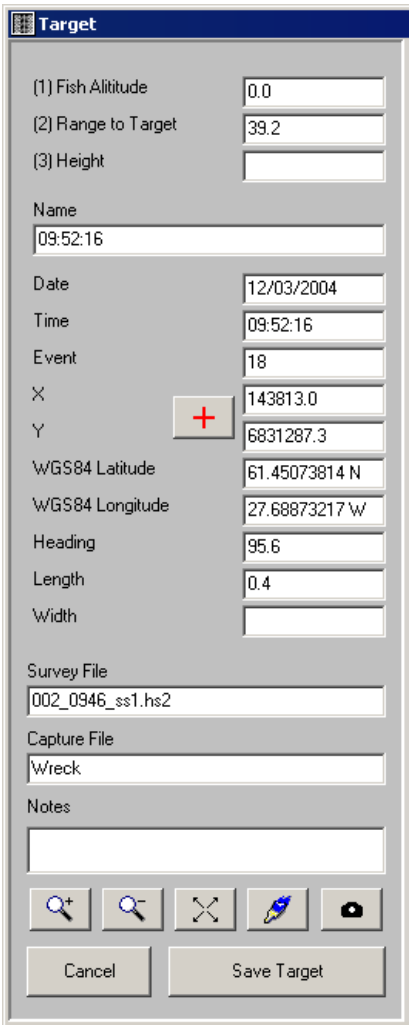
You can create targets to mark points of interest as you inspect your side scan data. The target file can then be saved and loaded to the HYPACK® window with your data files or the TIF file from SIDE SCAN MOSAIC to see them in the context of your survey area.

1. **Mark your targets** by double-clicking at the target location in the Scan View. When each target is created, the Target dialog will appear. If you have selected the 'Show Red Cross When Marking New Targets' option in the Advanced tab of the View Options dialog, a red '+' will appear at the target location.

   The following values will be saved to at least one target file:

   - **X, Y** position of the target.
   - **WGS84 Lat/Lon** position of the target.
   - **Heading** of your vessel when that location was scanned.
   - **Length** and **Width** of your target object.
   - **Survey File** that you are viewing.
   - **Capture File:** If you take a screen capture using the Capture Image icon, the jpg name will appear here.
   - **Notes:** Add a short note about the target.

FIGURE 5-33. Target dialog



2. **Edit any of these values** to suit your needs.

NOTE You can also reposition the target by clicking [+], then clicking the new position in the area view at the right.

3. **Click [Save Target]**. There are two saving routines. The one used depends on whether you have selected the 'One Target File Per Line/ Date' option in the Program Options dialog. (Refer to the following table.)

Red squares denote all targets marked while viewing the current line. Targets marked while viewing overlapping lines will be blue.

TABLE 5-2. *Target AutoManagement Save Option.*

Program Option 'One TGT per line /date' Checked?	Target Save Routine
Yes	The program will automatically append each target to two target files; one target file for the current line and one target file for the survey date. For example, a target created in line 005_0920_ss1.hs2 that was surveyed on November 8, 2004 is saved to 005_0920_ss1.tgt and 11082004.tgt. The target itself is named using the time that location was surveyed.
No	If this is the first target in a session, a File Save dialog will appear for you to name your target file. You can do either of the following: • **Create a new Target file** by entering a new file name. • **Select an existing Target file**, the current target will be appended to the selected file. The file will not be overwritten. Subsequent targets will automatically be saved to this target file until you leave SIDE SCAN MOSAIC.

MEASURING OBJECTS IN THE TARGETS WINDOW

You can also use the features in the Target dialog to measure:

- Fish height (Fish Altitude)
- Height of the object (Range to Target)
- Height of the object off the Bottom (Height)
- Length and width of the object (Length and Width)

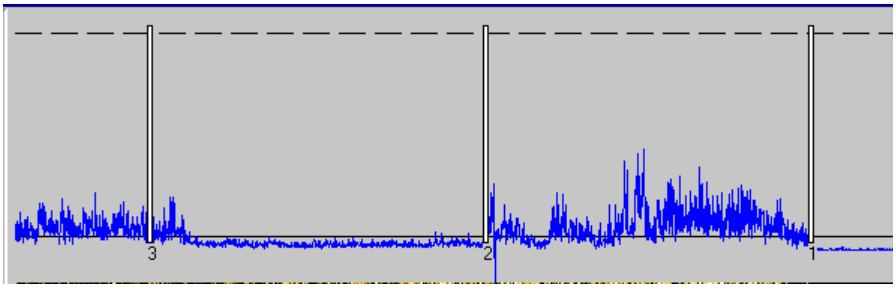
To make vertical measurements, drag the numbered bars over the return profile.

NOTE: All three bars must be positioned to obtain the correct measurements.

---

1. **Double click on the object that you would like to measure in the Scan View .** The Target dialog will appear with a section of your scan that includes the object of interest and a profile of your side scan returns at that point.

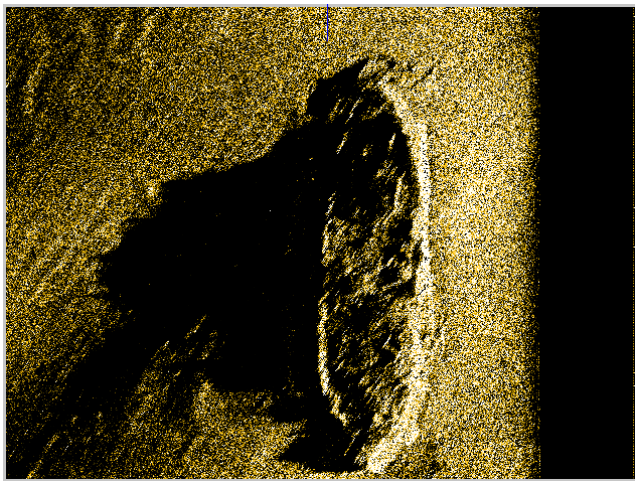
FIGURE 5-34. *Measuring Objects based on Side Scan Return*



Three sliding bars, each representing a vertical measurement, are superimposed on the return profile.

2. **Drag Bar 1 to the top of the water column** represented by the edge of the area of low return in the return profile. (This corresponds to the dark stripe in your scan view.) The Fish Altitude value on the left will update according accordingly.

FIGURE 5-35. *The water column is represented by the dark column on the edge of the Scan View display. If you were viewing only port or starboard, it would appear to one side.*



3. **Drag Bar 2 to the top of the object**. There should be an area of high returns in the profile, proportionate to the size of the object you are measuring, Place the bar on the edge of it closest to the water column. The Range to Target value on the left will update accordingly.
4. **Drag Bar 3 to the end of the shadow.** The Height value on the left will update.

We can also make horizontal measurements by dragging the cursor across the scan view.

To make horizontal measurements: Click in the length or width field then click and drag with the mouse across the corresponding dimension of the target object. The measurement at the left will update according to the distance between the click and release of the mouse button.

Screen Captures in Scan View

In the Target dialog, you can capture a selected part of the scanned image to a JPG and to a geo-referenced TIF file. Later, the JPG images can be viewed, each with its target information in the TARGET VIEWER and the geo-TIFs can be loaded as background charts.

The process varies according to the Automanagement options in the Advanced tab of the View Options dialog (F9).

- **If the 'Auto-Name Capture Files' option is not checked:**
  a. **Click the Capture Image icon**.
  b. **Use the cursor to drag a box around the area you want to capture**. The defined area will be drawn to a separate window.
  c. **If the defined area is satisfactory, click the Save icon in the pop-up window**. A File Save dialog will appear.
  d. **Name your file, select your file type** and click [OK]. The program will generate either a simple JPG or a geo-referenced TIF file. The TIF files are saved according to the Tiff Output options in the General tab of the view options (F9) dialog.
    - **Write GeoTif** (embedded TFW).
    - **Write TFW** file enables you to generate a separate file that contains coordinates that describe the location, scale, and rotation of the TIF. It is used by geographic information systems (GIS) software for locating areas in raster map images.
    - **Use LZW Compression**: This is a lossless compression algorithm that significantly reduces the resulting file size without losing resolution of the image.
- **If the Auto-name Capture Files option is checked** in the advanced tab of the View Options dialog (F9), the file will automatically be named using the time associated with the target location and the program will generate both a jpg and a geo-referenced TIF of the defined area.

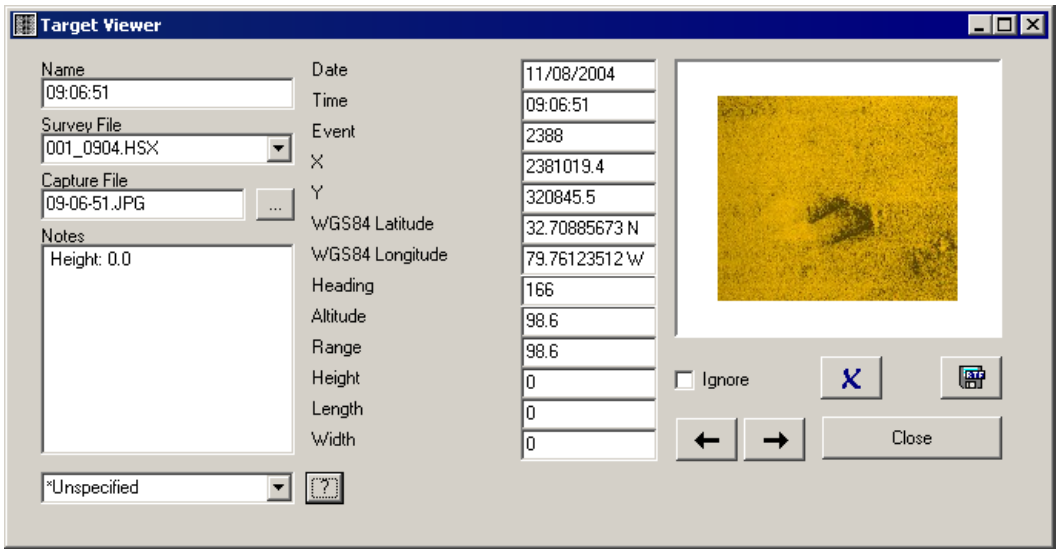
More Information

- "Setting Side Scan Mosaic Display Options" on page 5-18
- "Marking Targets in Scan View" on page 5-30
- "Reviewing Targets in the TARGET VIEWER" on page 5-34

Reviewing Targets in the TARGET VIEWER

The TARGET VIEWER displays all information about each target in one window. This is mostly *for display purposes only*; only the data in the left section can be edited in the TARGET VIEWER.

FIGURE 5-36. Sample TARGET VIEWER Display



To open the TARGET VIEWER:

- **In HYPACK®**, select SIDE SCAN-TARGET VIEWER. The program will automatically load the first enabled target file in the Project Files list. If no target file is loaded or if you want to choose a different file, select FILE-OPENand select the target file you want to review.
- **In SIDE SCAN TARGETING AND MOSAICKING**, select TOOLS-TARGET VIEWER. The targets included, in this case, depends on whether you have selected the 'One Target File per Line/Date' option in the Advanced Tab of your program options (F9).

TABLE 5-3. Targets Displayed in TARGET VIEWER

'One Target File per Line/Date' Option Selected?	Target File Loaded?	TARGET VIEWER does this...
Yes	Automatic	Loads all of the target files associated with the lines you have loaded, except the one named by the survey date.
No	Yes (Load a target file using FILE-SELECT TARGET FILE.)	Loads the currently loaded target file.
No	No	Displays a file select dialog for you to choose your target file.

Use the left and right arrows to view the targets, their corresponding statistics and screen capture (if you have saved one).

Modify any information in the left column as necessary.

- **Name**: The target name.

- **Survey File**: The survey line file that covers the area where the target is located.
- **Capture File**: Image file typically generated in SIDE SCAN TARGETING AND MOSAICKING.
- **Notes**: Short notes about the target.
- **Classification**: A classification code from the target classification database.

To delete the target currently displayed, click the Delete icon. If you are automatically managing your targets, the target will be deleted from both target files in which it resides.

More Information

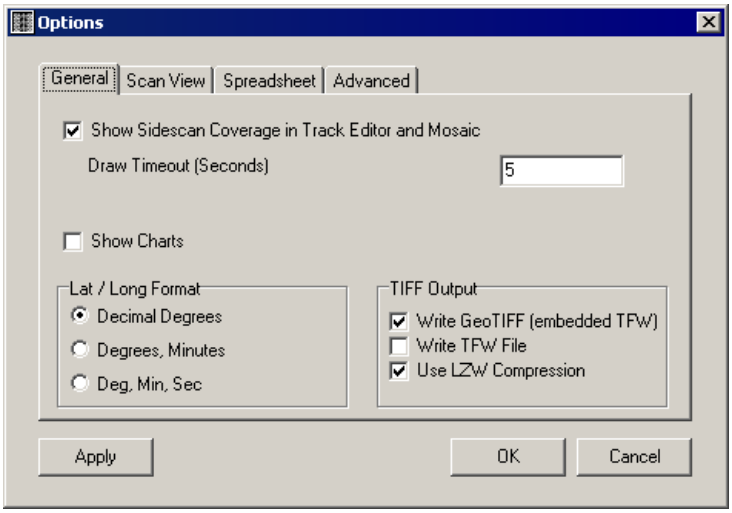
- "Screen Captures in Scan View" on page 5-34
- "Target Classification" on page 2-270

Converting the Side Scan Coverage Map to Geo-referenced TIF Files

You can export the content of the Coverage window to a geo-referenced TIF file. This geo-tif can be used as a background chart in other HYPACK® modules.

1. **Set your TIF Save options** in the View Options dialog.

FIGURE 5-37. *TIF Save Options*



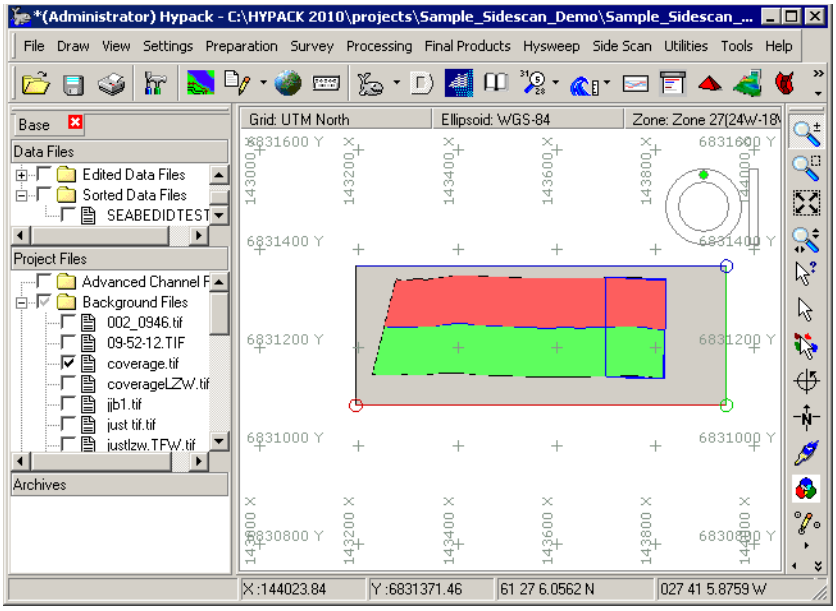
- **Write GeoTif** (embedded TFW).
- **Write TFW** file enables you to generate a separate file that contains coordinates that describe the location, scale, and rotation of the TIF. It is used by geographic information systems (GIS) software for locating areas in raster map images.

- **Use LZW Compression**: This is a lossless compression algorithm that significantly reduces the resulting file size without losing resolution of the image.

2. **Click the Save TIF File icon in the Coverage Map window.**

3. **Name your output** and click [OK].

FIGURE 5-38. *Coverage Map Geo-Tif in HYPACK®*

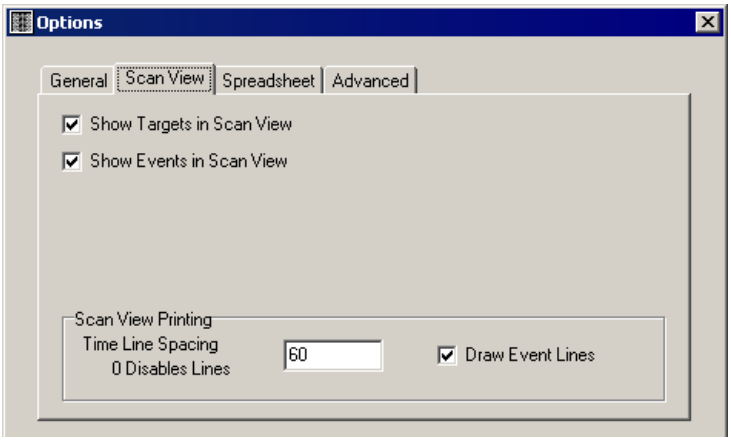


PRINTING THE SCAN VIEW IMAGE

If you would like a hard copy of your data, you can print the Scan View display.

1. **Set your print options**. Select VIEW-OPTIONS (F9), enter your print options in the Scan View tab and click [OK].

FIGURE 5-39. *Side Scan Mosaic View Options-Scan ViewTab*



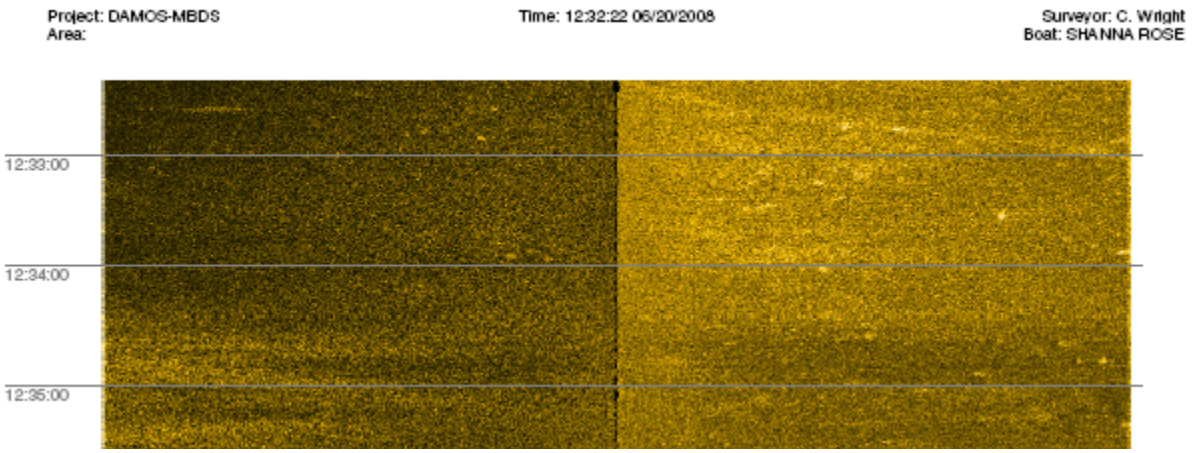
Under Scan View Printing:

- **Time Line Spacing in secs.**: Enter an integer to define the time interval at which the printout will include annotation lines. Enter '0' to disable this feature.
- **Draw Event Lines**: Check this option to annotate events in the printout.

2. **Click the print icon in the Scan View Window**. The Windows Print dialog will appear.
3. **Set your printer options and click [OK]**.

The hard copy includes your project information and the path of the project as well as the data, annotated according to your settings.

FIGURE 5-40. *Segment of Sample Hard Copy*



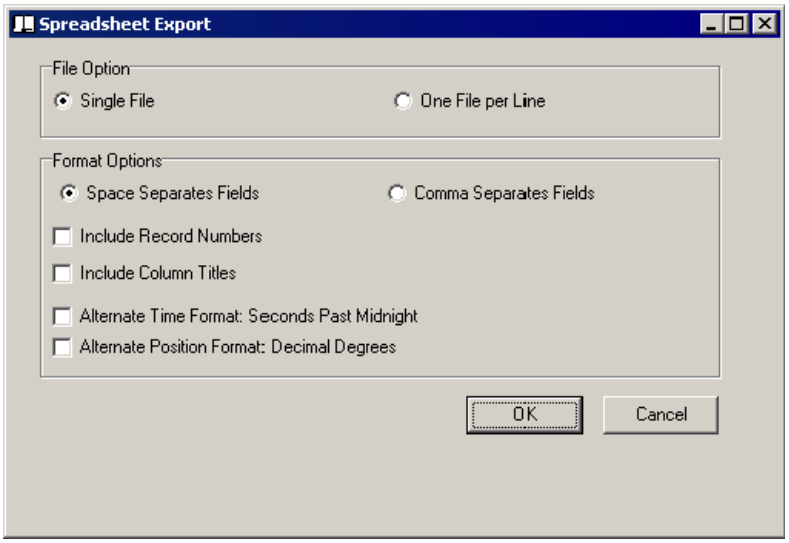
EXPORTING SPREADSHEET INFORMATION FROM SCAN VIEW

You can configure and export a text file from the data in the Spreadsheet window. This text file can then be imported to any ASCII text editor or to your favorite spreadsheet program.

To export your spreadsheet data:

1. **Click [Export] at the top of the Spreadsheet window**. The Spreadsheet Export dialog will appear.

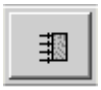
FIGURE 5-41. Configuring the Spreadsheet Export Report



2. **Set your export options and click [OK].**
   - **File Option:**
     - **Single File**: Generates one text file that contains the data from all survey lines loaded.
     - **One File per Line:** Generates one text file for each survey line loaded.
   - **Format Options:**
     - **Space Separates Fields** or **Comma Separates Fields:** Choose your preferred delimiter between values on each line.
     - **Include Record Numbers**
     - **Include Column Titles**
     - **Alternate Time Format: Seconds Past Midnight.** If this is not selected, it will export in hh:mm:ss.ss format.
     - **Alternate Position Format: Decimal Degrees**. If this is not selected, it will export in X, Y format.

CREATING GEO-REFERENCED TIF FILES IN MOSAIC MODE

The Mosaic Mode is accessed by selecting MODE-MOSAIC or by clicking the Mosaic icon on the toolbar. It is used to create a geo-referenced TIF file of your side scan data. Once the TIF file has been created, it can be used as a background file in your project.



NOTE: Currently, TIF files can only be created from XTF and HYPACK's HSX format files. (We hope to include MST and QMIPS files in this process soon.)

1. **Load the files**.

2. **Compute the size of the file at the default resolution**.
3. **Adjust the resolution (optional)**.
4. **Construct the mosaic.**
5. **Remove white space in the mosaic (optional)**.
6. **Save the mosaic to a geo-referenced TIF**.

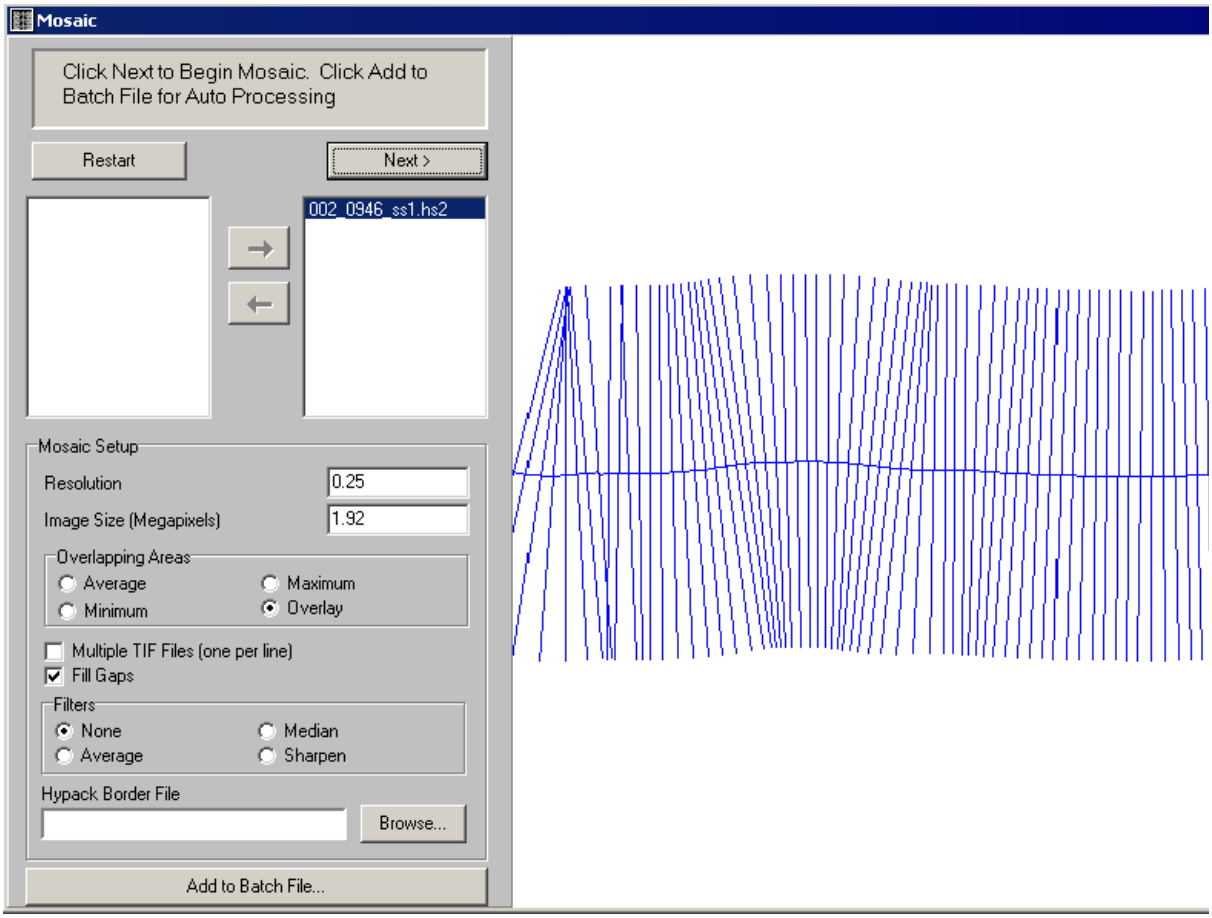
MOSAIC MODE INTERFACE

The Mosaic Mode is composed of a set of controls at the left, and the mosaic display on the right. When you first enter, the mosaic display is blank. The loaded files are listed, but must be selected to be included in the mosaic from which your TIF file will be produced. You can also display enabled charts, coverage diagrams or both through a right-click menu.

Show Charts displays charts currently enabled in your project.

Show Coverage displays a line drawing of the track and side scan swaths.

FIGURE 5-42. *Mosaic Mode*



To construct your mosaic, follow the directions in the upper left corner.

LOADING FILES FOR YOUR MOSAIC

All of the files that you have loaded to SIDE SCAN MOSAIC will initially be listed in the left-hand list in Mosaic Mode.

1. **Select the files that you want to include in the mosaic** (and ultimately the TIF file) by moving them to the list on the right.
   - **To select 1 or more files** (use the Shift key to select contiguous files or the Ctrl key to select multiple non-contiguous files) and use [=>] to move them to the right.

   - **Files can be removed from the selected files list** in the same manner using [<=] or the Remove All buttons.

2. **Click [Next]** to progress to the next step.

OPTIMIZING THE IMAGE IN SIDE SCAN MOSAIC

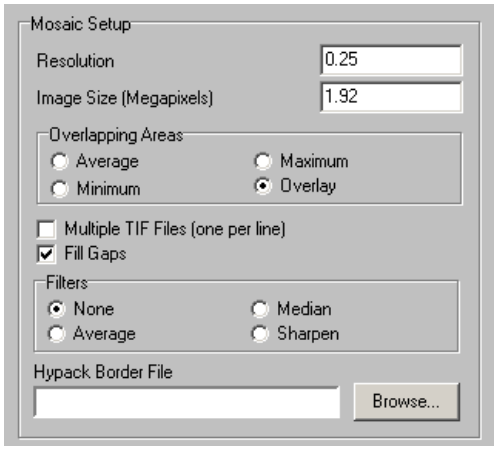
Once you have chosen your files for the mosaic, SIDE SCAN MOSAIC calculates the size of the TIF file that will result from the selected data at the current resolution.

NOTE: Remember that the mosaic is also affected by the settings in the Side Scan Controls (F9).

Adjusting the resolution affects file size and clarity of the image. A larger resolution makes a smaller, less detailed file. This feature can be especially useful if you have limited hard drive space as you can pre-determine the completed mosaic size will be no larger than your available space.

Set your resolution and click [Next]. If the file size is too large, click [Restart]. You can then reconsider your file choices and your resolution, then recalculate the file size until you are satisfied.

FIGURE 5-43. *Mosaic Statistics*



Overlapping Areas options instruct the program what values to use where there are multiple layers of data.

Multiple TIF Files (one per line): Generates a separate mosaic TIF for each line of data loaded.

Fill Gaps: Interpolates the data to fill uncovered areas.

Filters:

- **Average**: Smooths the mosaic by setting each pixel to the average of the 3 x 3 pixel neighborhood.
- **Median**: Smooths the mosaic while preserving edges by setting each pixel to the 3 x 3 median.
- **Sharpen Image**: Sharpens the mosaic by enhancing pixel contrast relative to 3 x 3 neighbors.

HYPACK® Border File: If you load a BRD file in this field, the mosaic generated will be limited to the area defined by the border file.

Click [Next] to create the mosaic

Constructing Mosaics and TIF Files from Side Scan Data

Once the files are loaded, and the resolution, data selection and blending methods are set, click [Next] to create the mosaic. The data files are corrected for heading and position changes, and merged to create a geo-referenced display on the right side of the Mosaic Mode.

If the mosaic is satisfactory, you can save it to a JPG or a geo-referenced TIF. You can do this immediately or, particularly if you are processing multiple sets of data, you can save this process to be run at a later time. To convert your mosaic to a geo-referenced TIF:

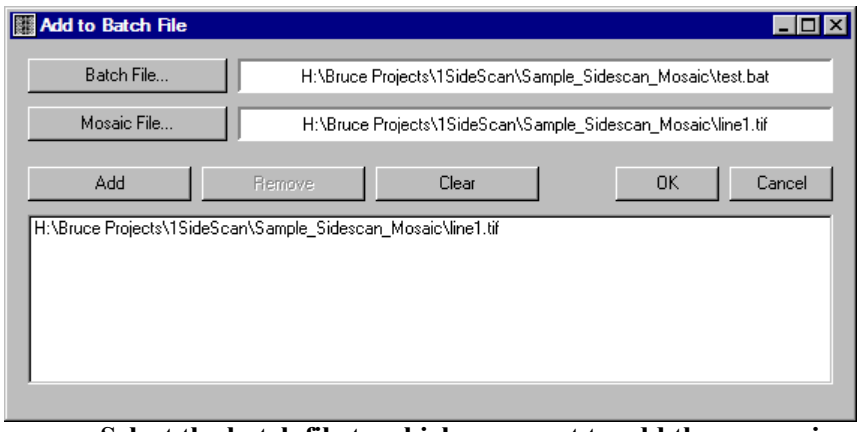
- **Immediately,** click [Next], select your file type and name your file.
- **Later using SIDE SCAN AUTOMOSAIC,** add it to a batch file. A Batch File is a series of programming commands. In this case, a batch file is generated that includes the file name (or names) and all of your chosen settings to create the mosaic and TIF. This allows you to edit and choose settings for multiple files or groups of files, but build the mosaics and generate the geo-TIFs at a later, more convenient time.

  For each file or set of files:

  a. **Load and process them in SIDE SCAN MOSAIC up to the point where you are ready to generate the mosaic.** At that point the [Add to Batch File] button is enabled

  b. **Click [Add to Batch File]** and the dialog will appear.

FIGURE 5-44. *Add to Batch File Dialog*



c. **Select the batch file to which you want to add the processing directions** by clicking [Batch File] and naming your file.

d. **Name your TIF** by clicking [Mosaic file] and entering a name (including the path).

e. **Click [Add]** and the name of the TIF to be generated when you run the batch file appears in the lower section.

f. **Click [OK]**.

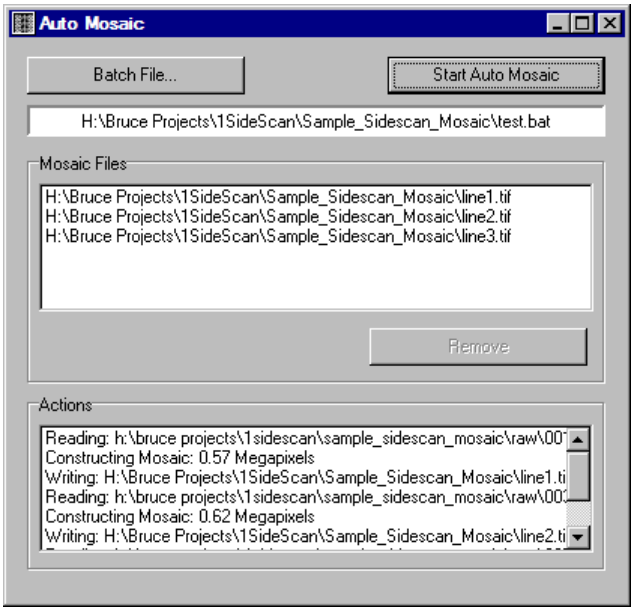
g. When you have a block of time when your computer is free, **generate all of the mosaics and TIF files at once** using the AUTOMOSAIC program.

   i. **Launch AUTO MOSAIC** by selecting SIDE SCAN-AUTO MOSAIC.

   ii. **Click [Batch File] and select the batch file you want to process.** The TIF files that are included in the batch will be listed under 'Mosaic Files'.

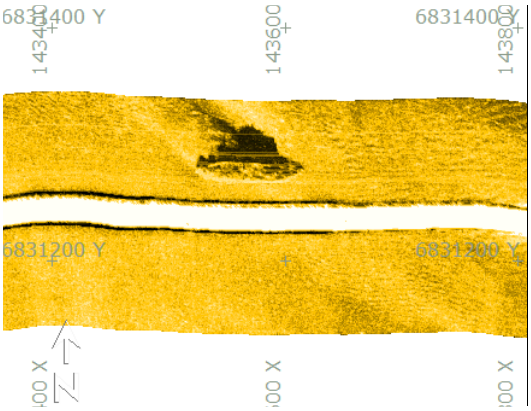
   iii. **Click [Start Auto Mosaic].** All of the processes saved to the batch will be run. The Actions area will display messages regarding the progress and the geo-referenced TIF files will be saved, by default, to the project folder.

FIGURE 5-45. *Auto Mosaic Program*



The TIF files can be used as a background file in your project. It can also be draped over the TIN Model in 3D TERRAIN VIEWER.

FIGURE 5-46. *Displaying the TIF File as a Background File in HYPACK®*

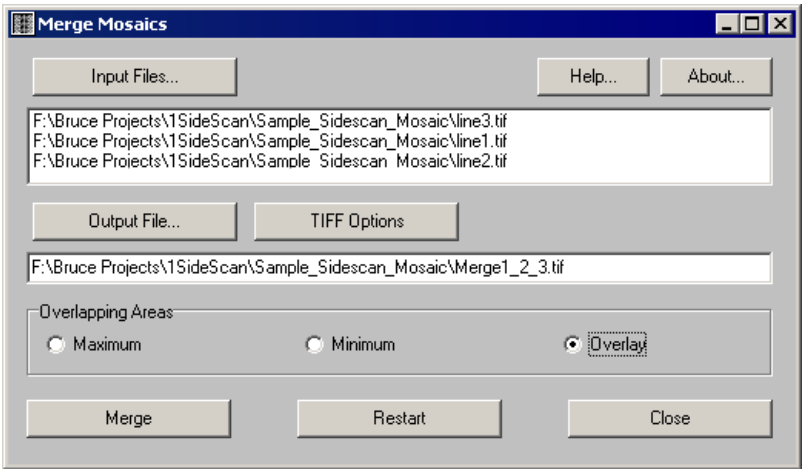


MERGING GEO-REFERENCED TIF FILES

The MERGE MOSAICS program can combine multiple geo-TIFs generated in SIDE SCAN MOSAIC. The merged file can then be displayed as a background chart.

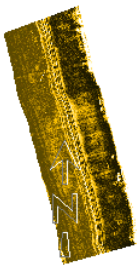
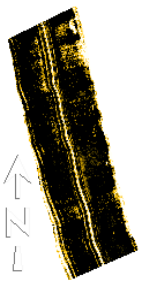
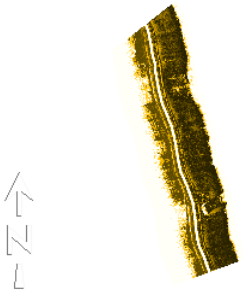
1. **Launch MERGE MOSAICS** by selecting SIDE SCAN-SIDE SCAN MERGE MOSAICS.
2. **Load the files that you want to merge** by clicking [Input files] and selecting them in the dialog that appears. If they reside in the same folder, you may select multiple files at once.

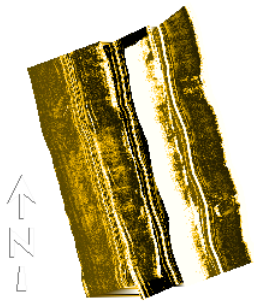
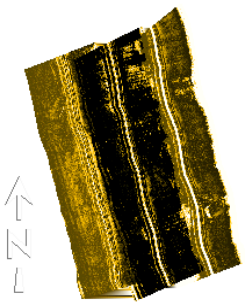
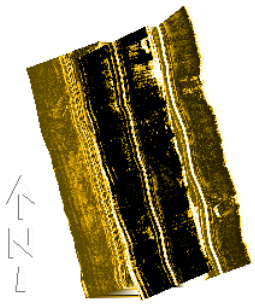
FIGURE 5-47. *Merge Mosaics Dialog*



3. **Name your merged file** by clicking [Output File] and entering the name.
4. **Select the value to be represented in any area where the input TIFs overlap**: Maximum, Minimum, or Overlay.
5. **Set your TIF options**.
   - **Write GeoTif** (embedded TFW).
   - **Write TFW** file enables you to generate a separate file that contains coordinates that describe the location, scale, and rotation of the TIF. It is used by geographic information systems (GIS) software for locating areas in raster map images.
   - **Use LZW Compression**: This is a lossless compression algorithm that significantly reduces the resulting file size without losing resolution of the image.
6. **Click [Merge].** A message appears at the bottom of the dialog indicating the merge progress. When it disappears, the merge is complete.

TABLE 5-4. *Comparison of Merge Options.*

Input Files			
	 *TIF 1*	 *TIF 2*	 *TIF 3*

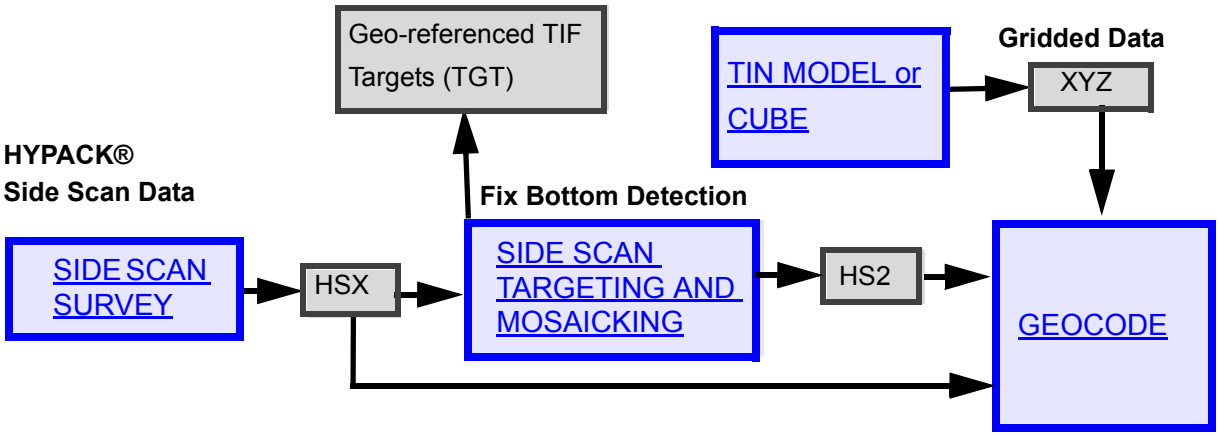
Output Files			
	 *Merged Maximum*	 *Merged Minimum*	 *Merged Overlay*

GEOCODER™ WITH SIDE SCAN DATA

GEOCODER™ is a program developed by Dr. Luciano Fonseca of the Center for Coastal and Ocean Mapping (CCOM) at the University of New Hampshire. The purpose of GEOCODER™ is to produce multibeam backscatter mosaics and ARA (Angular Response Analysis) seafloor characterization. It may also be used to generate mosaics of side scan data. GEOCODER™ has been licensed by HYPACK, Inc. for inclusion in HYPACK® software.

The following figure summarizes how each type of HYPACK® data is processed to format it correctly for GEOCODER™.

FIGURE 5-1. *Side Scan Flow Chart*



GEOCODER™ can be used to generate mosaics from Mosaic HYPACK® HSX files containing sidescan data. The data may come from traditional side scan (EdgeTech, Klein, etc.) or multibeam side scan (Atlas, Reson, etc.). Raw side scan records are tagged with RSS.

If you are processing HYPACK® HSX side scan data, you can get the best from both tools. Use SIDE SCAN TARGETING AND MOSAICKING to define the bottom track and remove the water column. Save the results in HS2 format then load that data into GEOCODER™ to take advantage of the advanced corrections settings before building the mosaic.

RUNNING GEOCODER™ WITH SIDE SCAN DATA

1. **Remove the water column from your data in SIDE SCAN TARGETING AND MOSAICKING. (Optional)** Some systems do better than others at bottom tracking. With all things being equal,

SIDE SCAN TARGETING AND MOSAICKING finds the bottom better than GEOCODER™.

2. **Launch the GEOCODER™** by selecting SIDE SCAN-GEOCODER.
3. **If this is the first time loading the data set to** GEOCODER™**, select PROJECT-NEW SESSION.**
4. **Select the data source from Source menu.** The "+Beams" and "+Bathy" options will correct the sidescan time series using known ranges. It results in a more accurately positioned sidescan image.

Data type	Source Selection
Side Scan Data (HSX)	'Sidescan Time Series'
Multibeams with co-registered Side Scan Data (HSX)	'Sidescan Time Series +Beams'
Side Scan Data (HSX or XTF) + XYZ (Digital Terrain Model (DTM))	Select 'Sidescan Time Series + Bathymetry'

5. **Enter calibration settings**.
6. **Load a gridded XYZ file of the area bathymetry.** (Optional) Click [...] next to the DTM field and choose the file.

   The TIN MODEL or MAPPER program can output the gridded XYZ file from your bathymetric data.

   - **With a DTM**, the data is used to generate a digital terrain model (DTM), which is factored into the calculations when the mosaic is constructed.
   - **Without a DTM**, GEOCODER™ will assume a flat bottom.
7. **Enter mosaic options**. (Optional) If you want to restrict the extent of the mosaic to the area covered by the DTM, you should check the 'Lock' option under 'Extents' in the Mosaic Options dialog. You can set the other options at the same time, but it may make more sense to wait until you have loaded your side scan data.
8. **Load your side scan data.** Select PROJECT-INSERT LINE and choose one or more HSX files. Track lines appear as the program reads each file.
9. **Save the project. (Optional)** Select PROJECT-SAVE SESSION, and provide a name. The data, along with your current settings, will be saved with a GPR extension, by default, to your project folder.
10. **Adjust calibration settings and mosaic options if necessary.**
    - **To modify calibration settings on individual lines,** click on the line in the graphic, then [Calibrate Settings]. Change the required options and click [OK].
    - **To modify your mosaic options**, click [Mosaic Options], change the required options and click [OK]. If you have not checked them already, you should definitely verify that you have the proper settings at this time.

11. **View the Histogram. (**Optional) Generally, this is more applicable to multibeam data when adjustments have been made for beam patterns and ARA (Angular Response Analysis).
12. **Generate your mosaic.** Just click [Make Mosaic] and the program does the rest. As the mosaic for each line is constructed, its track line appears in the right side of the window.
13. **Save the results to a geo-referenced TIF file.** Click [Save TIFF] and provide a name. The file TIF and its corresponding TFW file will be saved, by default, to the project folder.

More Information

- "Calibration Settings in GEOCODER™" on page 5-49
- "GEOCODER™ Mosaic Options" on page 5-51
- "MAPPER" on page 6-112
- "XYZ Export from TIN Models" on page 7-138

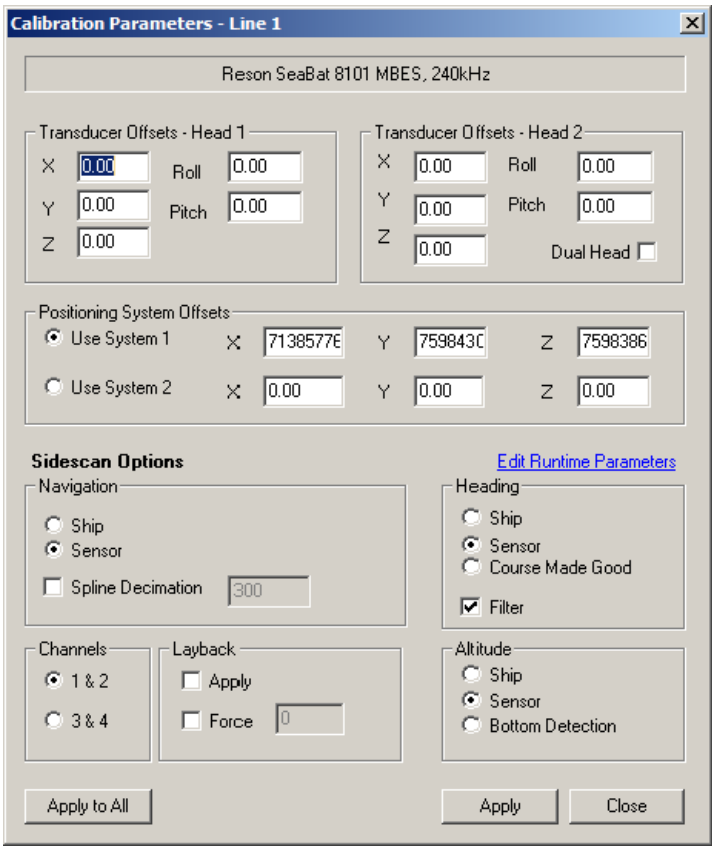
CALIBRATION SETTINGS IN GEOCODER™

The calibration settings confirm the hardware offsets that were configured to before the survey, and define the sources from which the side scan data should be read to construct the mosaic.

To access the calibration settings, click [Calibration Parameters].

The calibration settings set prior to loading the data are applied to *all* lines as they are loaded to the program. You *can*, however, apply different calibration settings to individual lines *after* the data has been loaded. To do this, select a line, click [Calibration Settings], enter the settings for that line and click [Close].

FIGURE 5-2. *Calibration Parameters Dialog*

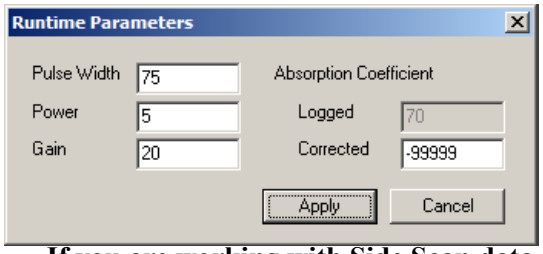


- **Verify offsets.** These fields are automatically populated based on data read from the line files. If you surveyed with erroneous offsets, enter the correct offsets here. The program will implement the corrected offset information in its output. *This will not affect the raw data*.
- **Side scan options:** Select the source from which GEOCODER™ should read each type of data.
  - **Heading** defaults to Ship heading if towfish heading is not found.
  - **Navigation** defaults to Ship position if towfish position is not found. **Spline Decimation** accounts for any curves in the trackline in calculating the positioning of the swath.
  - **Altitude:** We log only 1 altitude in the RSS record, which can be from your configuration. Select either '**Ship**' or '**Sensor**' to use the altitude data from the RSS record.

    If you choose the '**Bottom Detection**' option, GEOCODER™ uses its own algorithms to determine the bottom.
  - **Channels**: Select the frequency GEOCODER™ should use.
  - **Layback**:
    - **Apply** the layback calculated during survey or
    - '**Force**' GEOCODER™ to use a constant user-defined layback value.

- **Runtime Parameters** include information about your device settings (ex. pulse widths, power and gain). Normally, GEOCODER™ reads this information from your data files. If your data does not include this information, click the link and enter the values in the Runtime Parameters dialog. Any runtime parameters you enter will be ignored if the data already exists in your line files.

FIGURE 5-3. *Runtime Parameters Dialog*

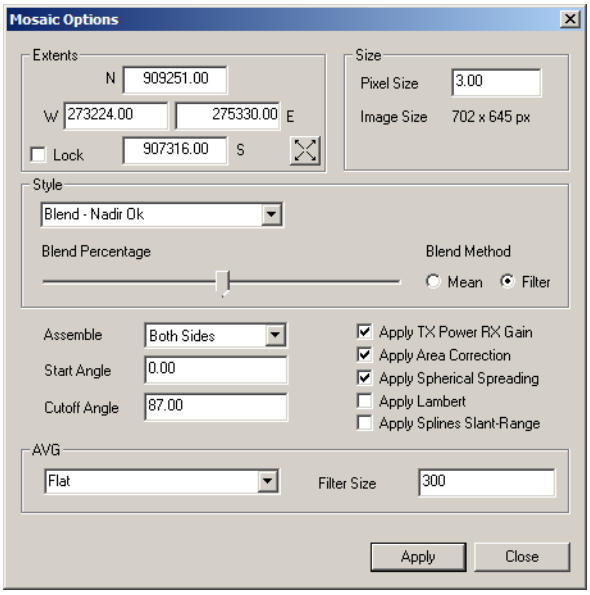


- **If you are working with Side Scan data, set applicable Side Scan options**.
  - **Sensor Navigation** designates whether the sensor is located on the main vessel (Ship) or the mobile (Sensor). Begin with a spline setting of 300 to smooth the track line.
  - **Sensor Altitude** designates the source of the height of your sensor off the bottom.
    - **Ship** if the data is read from a device driver assigned to the main vessel,
    - **Sensor** the data is read from a device driver assigned to another mobile
    - **Bottom Tracking** uses a value calculated from your data in GEOCODER™.
  - **Sensor Heading:** Course Made Good provides smoother lines, while the other 2 options tend to result in abrupt, unrealistic changes in direction.
  - **Channels 1 and 2** are typically the high frequency data, while **3 and 4** are low frequency.
- **Layback**: If you are using 'Sensor' positioning, you may choose to apply layback.
  - **To elect to apply layback**, check 'Apply'.
  - **To apply a constant, user-defined layback** value in place of the layback calculated during survey, check the 'Force' option and enter the layback value.

GEOCODER™ MOSAIC OPTIONS

The mosaic options provide instructions for building the mosaic from the data you have loaded.

FIGURE 5-4. Mosaic Options Dialog



Extents displays the geographic range to be covered by the mosaic. It automatically adjusts to the full extents of all data that has been loaded to the project. However you can set your own area by editing the values and checking the Lock option.

To restore the values to the extents of the data, click the zoom extents button.

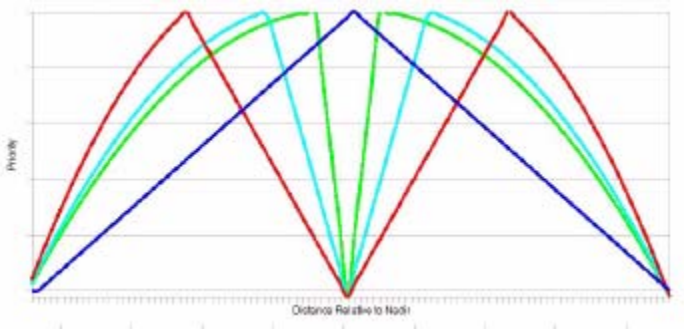
TIP: You can restrict your mosaic to the extents of the DTM by checking the 'Lock' option after loading only the DTM. Or you may manually edit the values and lock them.

Pixels Size determines the resolution of the mosaic. A smaller pixel size increases the resolution, as well as the file size of the finished mosaic.

Style:

- **No Nadir options:** Eliminate the nadir data and underweights the defined percentage of the swath (10%, 25%, 50%) extending from the nadir. If your nadir data is noisy, this option will eliminate it. The remaining values are underweighted more toward nadir and progressively less outward from nadir to the defined percentage. Underweighting indicates data of less quality and affects the blending with overlapping data.
  Nadir OK includes the data from the nadir beam in the mosaic.

FIGURE 5-5. *No Nadir 10% (green), 25% (Aqua), 50% (Red), Nadir OK (Blue)*



- **Blend:** Overlapping data is mixed based on the chosen style and Blend Percentage.
- **Blend Percentage Slider:** Affects the blending based on the relative weights of overlapping data. Once each value in each swath is weighted by your style option, the program compares the weights of the overlapping data. Logically, if the overlapping data is weighted equally, you would want both sets reflected in the blend. If, however, the data is weighted very differently, you would want the program to use the better data.
  - **With the slider far to the right**, blending will almost always occur, even though their weighting is quite different.
  - **With the slider far to the left**, the program will usually present the data from the data set with the greater weight.
  - **With the slider at a mid-range position**, the two methods are combined.
- **Mean**: This is a straight average of overlapping data values.
- **Fill Gaps:** Data from the selected line is used only where there is no other overlapping data. This is useful if you have a line with a few gaps. You can re-run the same line, but remosaic using the second one to fill the spaces in the first.
- **Overlay** brings the selected line to the top when the mosaic is drawn.
- **Delete** omits the line from the m osaic. This option should only be applied to select lines. (If it were applied to all line, you would have no data left with which to build a mosaic.)

TIP You can quickly preview possible changes to the mosaic layering w/ a quick keystroke combination. These options are for display purposes only and will revert to the true settings the next time the screen redraws (zoom, pan, change view option).
Alt + Double-click: Line drawn on top
Shift + Double-click: Line drawn on bottom
Ctrl + Double-click: Line omitted from the drawing.

Assemble: You can elect to use data from port, starboard or both to build your mosaic.

Start and Cutoff Angles, relative to nadir, define the range of beams to be included in your mosaic. This option allows you to omit noise around the nadir and at the outer edge.

'Apply' options: When the program reads the side scan data, it separates the components. This enables you to chooose which of them should be included in the mosaic. By default, TX Power RX Gain, Area Correction and Spherical Spreading are checked.

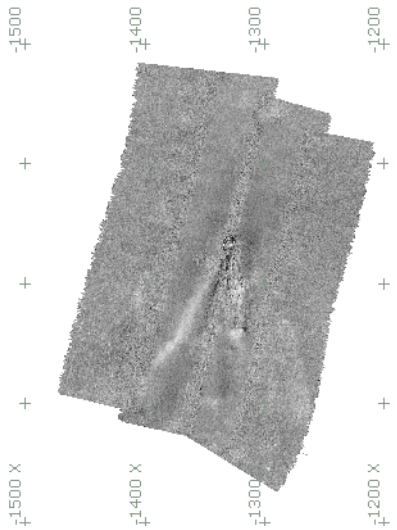
AVG Filter: These options assume a flat bottom. Use 'Trend' to apply the DTM. **Filter size** is the number of pings affected by the AVG option. The default value is 300.

SAVING YOUR MOSAIC FROM GEOCODER™

A geo-referenced TIF can be loaded to any HYPACK® program that supports background charts. This allows you to display your mosaicked data in the context of your other project files.

To save your mosaic as a geo-referenced TIF select FILE-SAVE GRAYSCALE TIFF (or click [Save TIFF]), or select FILE-SAVE COLOR TIFF and provide a name. The chart file of *only the mosaicked data* will be saved with a TIF extension to the name and place you define.

FIGURE 5-6. *Displaying a Geo-referenced TIF in HYPACK®*



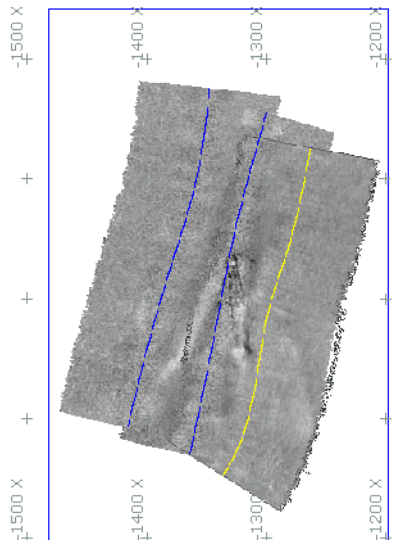
- **A screen capture of the mosaic window**. This includes the tracklines and the border around the mosaic. This is also a geo-referenced TIF, but the resolution is not as good as what you can generate with to the geo-referenced TIF.

  To save a screen capture:

a. **Set your TIFF output options** in the Program Options dialog.
   - **Write GeoTif** (embedded TFW).
   - **Write TFW** file enables you to generate a separate file that contains coordinates that describe the location, scale, and rotation of the TIF. It is used by geographic information systems (GIS) software for locating areas in raster map images.
   - **Use LZW Compression**: This is a lossless compression algorithm that significantly reduces the resulting file size without losing resolution of the image.

b. **Select FILE-SAVE VIEW AS TIFF** and provide a name.

FIGURE 5-7. *TIF Screen Capture*



CHAPTER 6

HYSWEEP®

MULTIBEAM PROCESSING OVERVIEW

With so many sounding selection and final product programs, it can be a bit confusing, at first, to work out just what your task sequence should be between your raw data and your final product. The following flowcharts should guide you along your way.

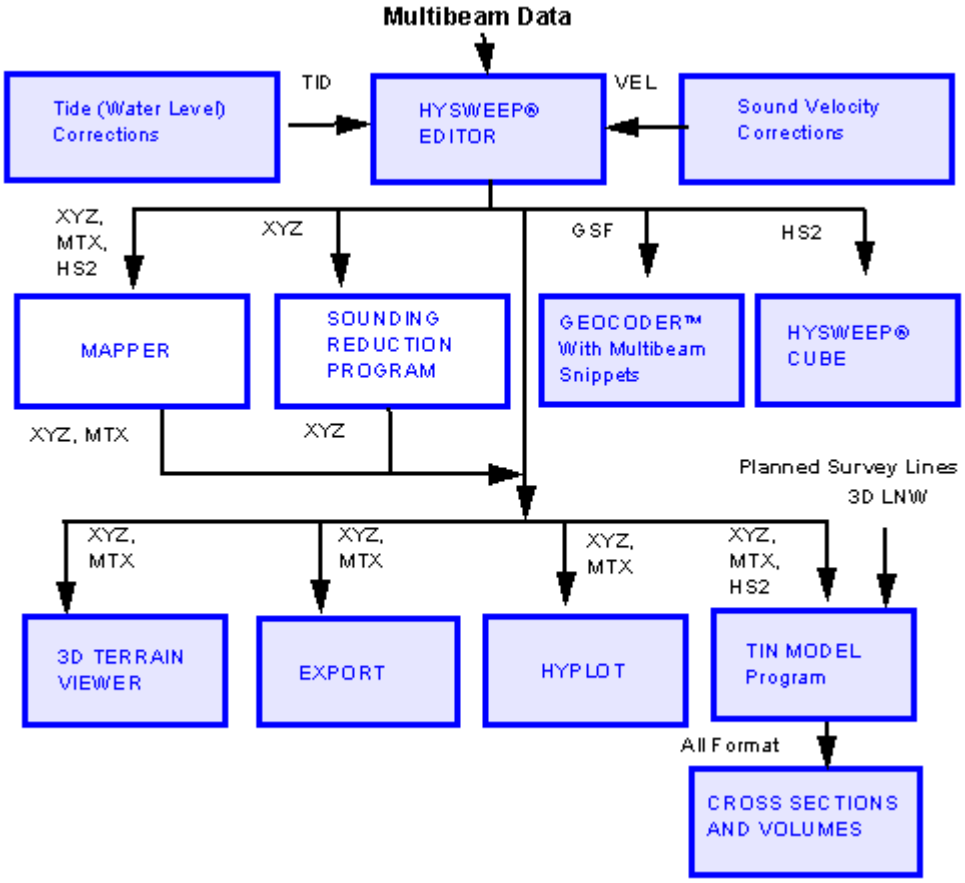
All multibeam or multiple transducer data should first be run through the HYSWEEP® EDITOR to apply corrections that may not have been applied during the survey and edit out bad data. The resulting output options include HS2 format files, XYZ format files, filled matrix (*.MTX), GSF format and our old SWP format.

The sounding selection programs (MAPPER and SOUNDING REDUCTION) are optional programs that eliminate data in an attempt to speed your final product calculations without adversely affecting the accuracy of the results.

HYPLOT, TIN MODEL and EXPORT use XYZ format to create their final products.

CROSS SECTIONS AND VOLUMES requires channel template information to do its calculations. Since XYZ files contain no template data, we have to convert the XYZ format to All format by loading it, with a planned line file, into the TIN MODEL program and cutting sections where the TIN model and planned line intersect.

FIGURE 6-1. *Multibeam Work Flow*



More Information

- “Tide (Water Level) Corrections” on page 8-1
- “HYSWEEP® EDITOR” on page 6-3
- “Sound Velocity Corrections” on page 4-4
- “SOUNDING REDUCTION PROGRAM” on page 6-121
- “MAPPER” on page 6-112
- “GEOCODER™ With Multibeam Snippets” on page 6-89
- “HYSWEEP® CUBE” on page 6-77
- “3D TERRAIN VIEWER” on page 7-279
- “EXPORT” on page 7-179
- “HYPLOT” on page 7-1
- “TIN MODEL Program” on page 7-110
- “CROSS SECTIONS AND VOLUMES” on page 7-35

HYSWEEP® EDITOR

The HYSWEEP® EDITOR primarily reads raw or edited sounding files containing multibeam and multi-transducer data. If you are using raw data, it applies tide, draft and ray-bending corrections to the soundings to find corrected depth or elevation. The HYSWEEP® EDITOR displays all measurements graphically and provides a number of editing methods.

When editing is complete, the program saves the corrected and cleaned data for further work in the Sounding Selection and Final Product programs.

You must have a HYSWEEP® hardlock to run this program.

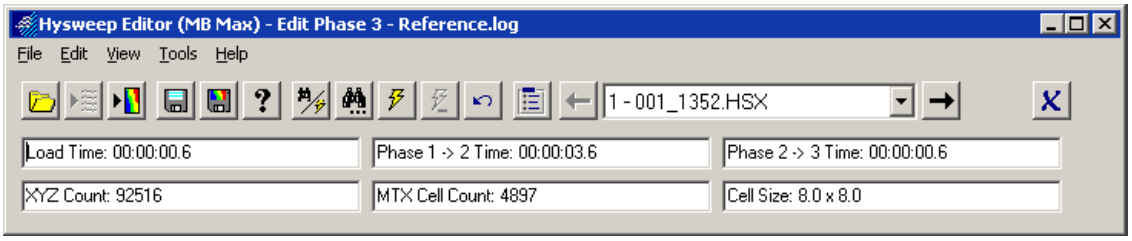
Before you begin your editing session, check the following items:

- **Confirm that your Geodetic Parameters** match those of your survey data.
- If you have not applied tide corrections during your survey, **create a Tide Corrections file** using the MANUAL TIDES or HARMONIC TIDES program.
- If you have not logged Sound Velocity during your survey, take a Sound Velocity cast and **create a Sound Velocity file** in the SOUND VELOCITY program.

HYSWEEP® EDITOR PROCEDURE

1. **Open the HYSWEEP® EDITOR** by selecting HYSWEEP-HYSWEEP® EDITOR or by clicking the icon.

FIGURE 6-1. *HYSWEEP® EDITOR Shell*



2. If you have XTF files**, use the XTF to HSX Conversion Tool to convert them to the HSX format** that the HYSWEEP® EDITOR recognizes.
3. **Select your Soundings file** by selecting FILE-OPEN (or using F2). You can select a Catalog file (*.LOG), which is a list of several data files, or a single data file. the HYSWEEP® EDITOR can read either raw or edited soundings. It is intended for use with multibeam and multiple transducer data. The File Options dialog will appear next.

4. **Set file options.** These are some basic choices about how the HYSWEEP® EDITOR will read and save the data.
5. **Enter your corrections.**
   - **If you are working with raw data and have not applied tide corrections during your survey**, select the tide corrections (*.TID) file to which you want to apply the data. This option is disabled if you are working with edited files.
   - **If you are working with raw data and have not applied sound velocity corrections during your survey,** select the sound velocity corrections (*.VEL) file to which you want to apply the data. This option is disabled if you are working with edited files.
6. **If you are working with raw data, set your read parameters.** This enables you to apply pre-filtering and perform other operations on the data as it is read into the editor.
7. **Examine and edit your data.** This is a three phase process. Each phase will automatically display the windows as described but you can access any window at any time through the View menu options.
   a. **Phase One:** Examine and edit the graphs representing corrections and track lines.
   b. **Convert raw data to corrected** by selecting FILE-CONVERT RAW TO CORRECTED (F4).
   c. **Phase Two:** Graphically examine the Soundings. Scroll through the survey lines by using the arrow buttons, making any necessary corrections for each sweep. Repeat the editing process for each selected survey line until you have edited all of your data
   d. **Grid your data** by selecting FILE-FILL MATRIX (or click the icon). The Matrix Options dialog will appear. You can choose to use a Matrix file that has been created in the MATRIX EDITOR. Otherwise, you may choose to allow the HYSWEEP® EDITOR to set the matrix dimensions, and rotation while you choose the cell dimensions.
      The edited data will be filled into the matrix and displayed in the Cell, Profile and Survey Windows that follow.
   e. **Set your Search and Filter Options.** These criteria are used in the next editing phase to search out cells with data outside of the specified limits. You can evaluate each instance yourself or instruct the HYSWEEP® EDITOR to delete all points outside the limits.
   f. **Phase Three:** View and Edit any additional points in the Cell, Profile and Survey Windows. You can view the data a little more closely and from all angles in these windows. The same editing tools used together with the Search and Filter feature are effective in cleaning up any stray points.
8. **Save the final edited data.** FILE-SAVE will save the data, in the format specified in the File Options, to the Edit directory unless you choose to perform an XYZ reduction. In this case, it will be saved to

the Sort directory. FILE-SAVE TO MATRIX saves a filled Matrix File to the project directory.

9. **Exit the** HYSWEEP® EDITOR by selecting FILE-EXIT.

More Information

- "Selecting Sounding Files in the HYSWEEP® EDITOR" on page 6-5
- "File Open Options in the HYSWEEP® EDITOR" on page 6-6
- "Corrections in the HYSWEEP® EDITOR" on page 6-7
- "Read Parameters in the HYSWEEP® EDITOR" on page 6-17
- "Windows in the HYSWEEP® EDITOR" on page 6-23
- "Display Settings in the HYSWEEP® EDITOR" on page 6-33
- "Search and Filter Options in the HYSWEEP® EDITOR" on page 6-42
- "Editing Data in the HYSWEEP® EDITOR" on page 6-48
- "Saving Edited Multibeam Survey Files" on page 6-66

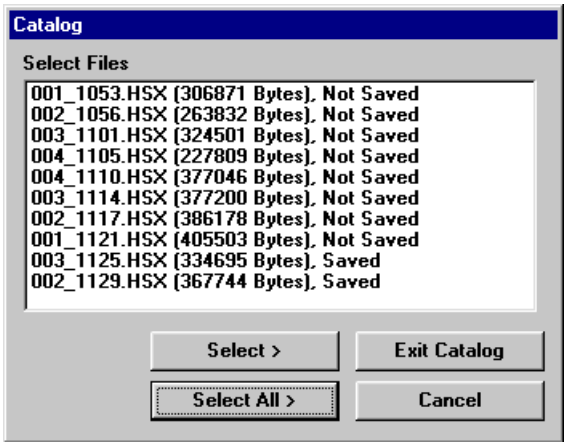
SELECTING SOUNDING FILES IN THE HYSWEEP® EDITOR

Select FILE-OPEN to call up an open dialog. The default directory will be the project file. The HYSWEEP® EDITOR works with multiple file formats. Multibeam data can be read from any of the following:

- **HYPACK® Raw Data:** Multibeam (and single beam) files collected by the HYPACK® SURVEY program. Multibeam raw files have the HSX extension.
- **HS2 Format:** Files edited and saved by the HYSWEEP® EDITOR. This format retains all data and can be reloaded for further editing into the HYSWEEP® EDITOR. They also can be corrected for invalid offsets, mounting angles, sound velocity, etc so it's smart to save this format when your editing is complete.
- **XYZ** is the format used in the sounding Selection and Final Products programs.
- **HYPACK® SWP:** Files edited and saved by the old HYSWEEP® EDITOR

You may select either individual files or a catalog file. A catalog file is a list of individual data files. If a catalog file is selected, the HYSWEEP® EDITOR reads the file and provides you with a list of files in the catalog.

FIGURE 6-2. *Selecting your files in the HYSWEEP® EDITOR*



You can include all of the line files by clicking [Select All] or you can include individual files by highlighting them and clicking [Select].

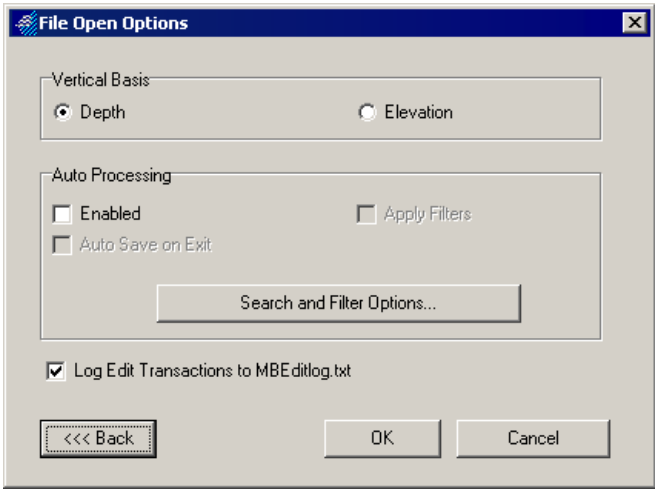
NOTE: The HYSWEEP® EDITOR can handle a maximum of 512 lines at a time.

The HYSWEEP® EDITOR will default to the next selected file in the list every time you scroll to the next line file number in the Line field at the end of the HYSWEEP® EDITOR toolbar. This list will also be used to track which files have been edited.

FILE OPEN OPTIONS IN THE HYSWEEP® EDITOR

Once you have selected the files to be included in the edit, the HYSWEEP® EDITOR provides you with some options for reading and storing your sounding data.

FIGURE 6-3. *The File Options Dialog*



Vertical Basis determines depth or elevation mode where elevation mode will invert the soundings.

Auto Processing skips phase 1 and 2 editing. Tide and Sound Velocity corrections are applied and the soundings are gridded into a matrix. The results are displayed in the Survey, Profile and Cell windows, ready for Phase 3 editing. Check **Apply Filters** to also delete all points in the entire data set that fall outside the filter limits set by the Search and Filter Options.

Click **[Search and Filter Options]** to set the criteria used in auto-processing.

Beware!

BEWARE! No computer program can replace human intelligence and common sense when it comes to editing data. *Use this feature with caution!*

Log Edit Transactions to MBEditLog.txt creates a record of:

- Files Loaded
- Correction Files
- Search and Filter Options
- Files Saved
- Vertical Basis
- Read Parameters
- Fill Matrix Options

CORRECTIONS IN THE HYSWEEP® EDITOR

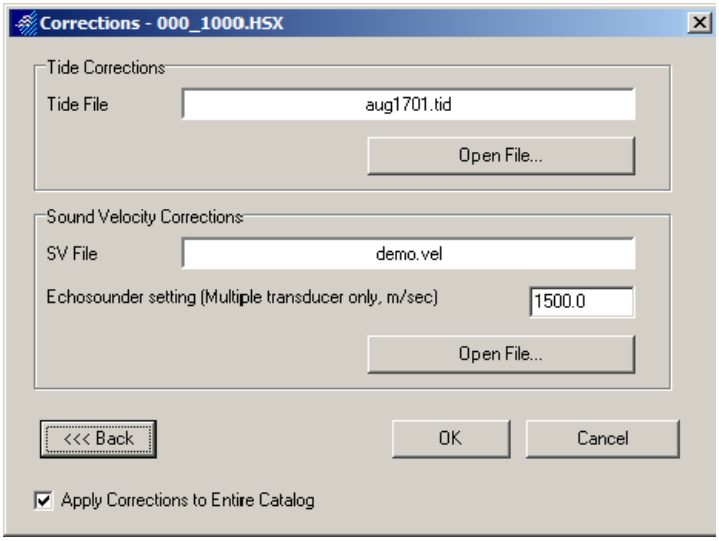
The HYSWEEP® EDITOR enables you to work in depths or elevations, applying Tide, Draft and Sound Velocity Corrections along the way.

Corrected Depth = Tide Correction + (Raw Depth + Transducer Depth Offset + Draft Correction)

Corrected Elevation = Tide Correction - (Raw Depth +Transducer Depth Offset + Draft Correction)

If you are working with raw data, the Corrections dialog enables you to apply tide and sound velocity corrections to your edited data.

FIGURE 6-4. Corrections Dialog



- **Set your Tide Corrections**.
- **Set your Sound Velocity Corrections**
- **Set the Echosounder value** to the sound velocity setting the transducers were using while collecting data.
- **Apply Corrections to Entire Catalog** enables you to use the same set of corrections for all of your selected files. If this is not checked, the HYSWEEP® EDITOR will ask you to set corrections for each survey line loaded. Set the corrections for the line named in the title bar and click [Next]. The Corrections dialog will appear once for each selected line.

Draft Corrections: Static draft is included in your echosounder calibration. Dynamic draft is logged to your raw data files during survey.

More Information

- "Calibrating your Hardware" on page 2-168
- "Draft Corrections in SURVEY" on page 3-65
- "Tide (Water Level) Corrections" on page 8-1

TIDE CORRECTIONS IN THE HYSWEEP® EDITOR

Tide Corrections are usually read from Tide Files (*.TID) created by the MANUAL TIDES or HARMONIC TIDES PREDICTION programs. They may also be read from Raw Survey files that have tide information in their headers.

Tide Corrections relate raw soundings to the chart (low water) datum. When creating a tide file for depth mode, enter tide values as negative numbers. When creating a tide file for elevation mode, enter tide values as positive numbers. Units are according to those selected under Geodesy (feet or meters).

Applying Tide Corrections in the HYSWEEP® EDITOR

If tide corrections were not recorded during your survey or you need to change your tide corrections, select a tide file in the corrections dialog.

1. **Click [Open File] in the Tide File section and choose the TID file** from the file selection dialog.
2. **Check the 'Apply to all files in the catalog' option**.

Alternatively, after the data has loaded to the HYSWEEP® EDITOR, you can select TOOLS-TIDE ADJUSTMENTS-TIDE FILE and select a TID file from the file selection dialog.

NOTE: Loading a TID file in the HYSWEEP® EDITOR will override tide corrections stored in your raw data or overwrite any tide corrections value previously saved in your edited data.

Interpolating Tide Corrections from Multiple Tide Gauges

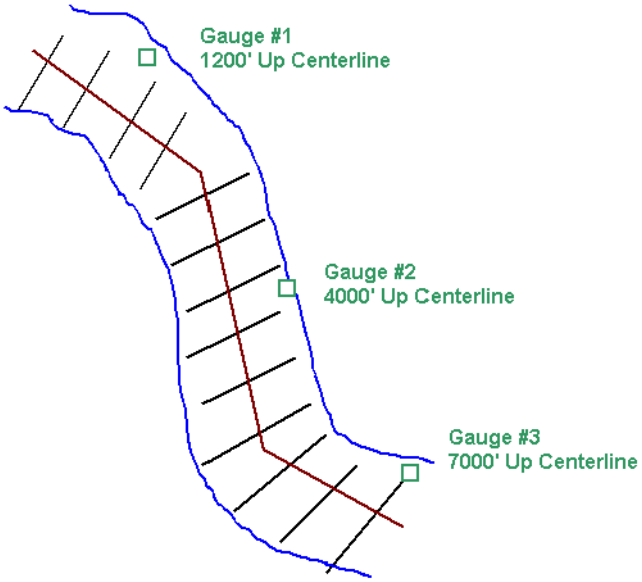
The TIDE ADJUSTMENTS program interpolates tide correction values from multiple tide gauges. This tool is available in the SINGLE BEAM EDITOR and during the first phase of editing in the HYSWEEP® EDITOR to adjust the tide data of the edited output files. The program has two routines:

- The **center line method** for surveys where the tide gauges are in a line along a river or coastline. TIDE ADJUSTMENTS will interpolate tide correction values, based on the distances along a line between gauges.

  You will need:

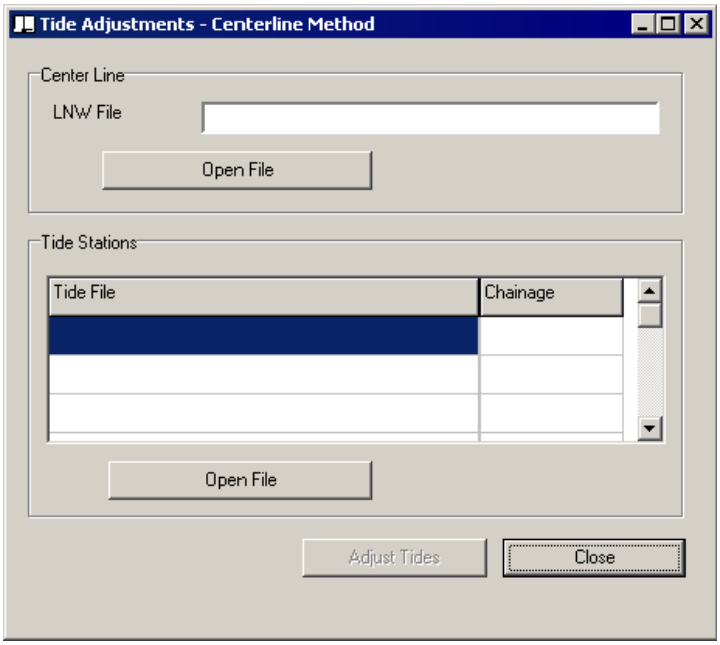
  - A *.TID file for each gauge location
  - The distance of each gauge along the center line.
  - A *.LNW file that contains just the center line (limited to 1000 waypoints).
  - The data files you wish to adjust.

FIGURE 6-5. *River with 3 Tide Gauges and a Center Line LNW File*



a. **Start the program by selecting TOOLS–TIDE ADJUSTMENTS-CENTER LINE METHOD.** The Tide Adjust dialog will appear.

FIGURE 6-6. *Tide Adjust Dialog*



b. **Enter the name of the *.LNW file that has your center line (and nothing else).** Click [Open File] below the LNW File field and select the file name from the File Select dialog.

c. **Enter the names of the *.TID files.** For each Tide file, place your cursor in the first available cell in the table, click [Open

File] under Tide Stations and select the Tide file from the file selection dialog.

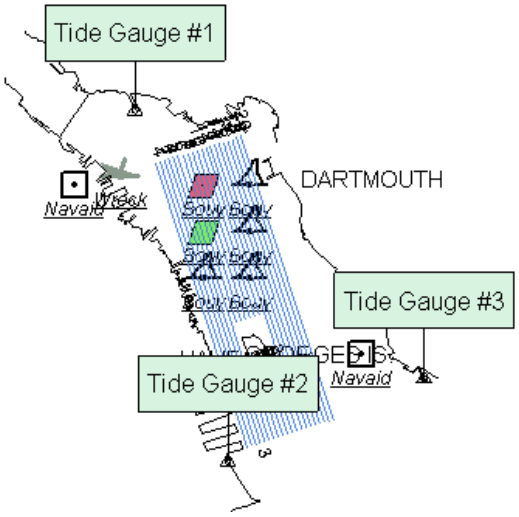
d. **Enter the Chainage** (and their distances along the center line) for each Tide File.

e. **Correct the soundings by clicking [Adjust Tides].** The program will assign tide correction values only to the edited files. It does not change the raw files.

- The **three point method** for survey areas with 3 tide gauges around the area. The program creates a triangular tidal surface between the three stations to generate a correction at the vessel position.

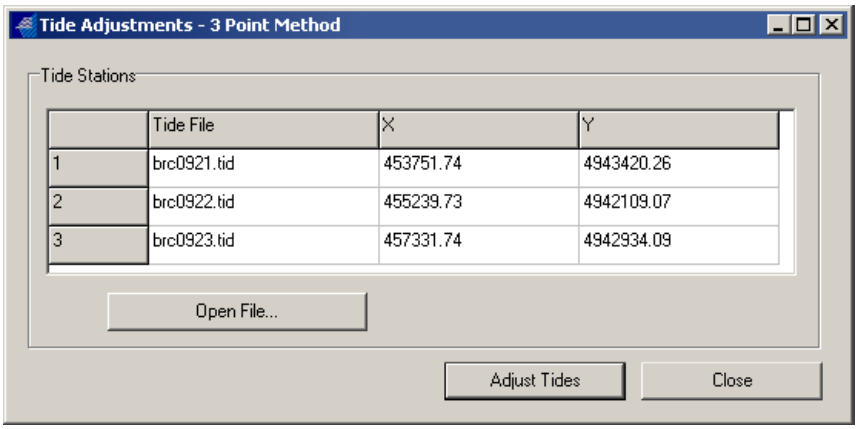
NOTE: For best results, your survey area lie within the triangular area defined by the three tide stations.

FIGURE 6-7. *Tide Adjustments - 3 Point Method*



a. **Start the program by selecting TOOLS–TIDE ADJUSTMENTS-3 POINT METHOD.** The Tide Adjustments dialog will appear.

FIGURE 6-8. Tide Adjustments Dialog



b. **Enter the names of the *.TID files.** For each Tide file, place your cursor in the first available cell in the table, click [Open File]and select the Tide file from the file selection dialog.

c. **Enter the position of each tide gauge** for each Tide File.

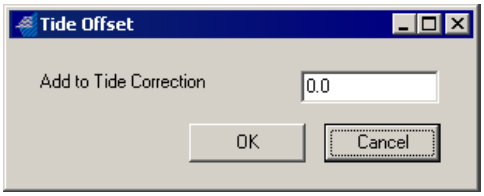
d. **Correct the soundings by clicking [Adjust Tides].** The program will assign tide correction values only to the edited files. It does not change the raw files.

OFFSETTING TIDE CORRECTIONS

If, once you load your tide corrections, you discover that they are all off by a constant amount, this tool enables you to shift each tide correction by the same user-defined amount.

1. **Select TOOLS-TIDE ADJUSTMENTS-TIDE OFFSET.** The Tide Offset dialog will appear.

FIGURE 6-9. Tide Offset Dialog



2. **Enter the amount, in survey units, that you need to adjust the tide corrections.** This value will be added to the current tide correction for each sounding so, if you need to decrease the tide correction, enter a negative number.

3. **Click [OK].** The graph in the Tide and Draft Corrections window will update automatically. In the Spreadsheet window, click the [Refresh] button to display the updated tide values.

RECALCULATING RTK TIDES FROM RAW DATA IN THE HYSWEEP® EDITOR

Often users collect RTK (Real Time Kinematic) data then discover that their configuration was not quite correct. Some errors result in inaccurate RTK tide calculations in your raw data:

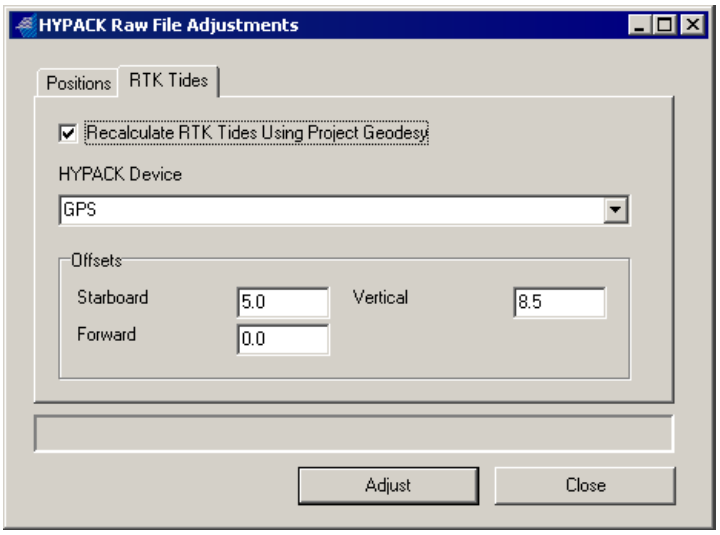
- Incorrect geoid model (if you are using one) or orthometric height correction in your geodesy settings.
- Incorrect KTD (Kinematic Tide Datum) information.
- Hardware configuration excludes the Tide function for the GPS.

Without this feature, surveyors who collected data with such errors would be forced to resurvey the area after correcting their project configuration.

This tool enables you to recalculate the RTK tide value in the editor program based on the current geodesy settings; the currently enabled KTD file in your project; and the RAW messages in your raw data files.

1. **Load your raw data to the HYSWEEP® EDITOR**.
2. **In the Corrections dialog, leave the Tide Corrections option blank**.
3. **In phase one editing, select TOOLS-HYPACK RAW FILE ADJUSTMENTS**. The Raw File Adjustments dialog will appear.

FIGURE 6-10. *Raw File Adjusments Dialog - RTK Tides Tab*



- **Check the 'Recalculate RTK Tides Using HYPACK Geodesy' option**.
- **Select the device** from which you collected the data to be recalculated.

4. **Click [Adjust]**.
5. **Return to the HYSWEEP® EDITOR** by clicking [Close].

SOUND VELOCITY CORRECTIONS IN THE HYSWEEP® EDITOR

If you are editing raw data and have not yet applied sound velocity corrections, select one or more Sound Velocity Corrections file. (You can load up to 48 VEL files.) Sound Velocity Corrections are read from *.VEL files created in the Sound Velocity program or generated with during survey with a Moving Vessel Profiler™ and the MVP.dll. The HYSWEEP® EDITOR can:

- **Apply one VEL file to all data in your survey.** Use this option if the sound velocity profile in your survey area is uniform.
- **Apply one VEL files per line**.
- **Interpolate between multiple VEL files**, based on time.

To assign one sound velocity file to all of your data:

1. **Click [Open File] in the Sound Velocity Corrections section and choose the VEL file** from the file selection dialog.
2. **Check the 'Apply to all files in the catalog' option**.

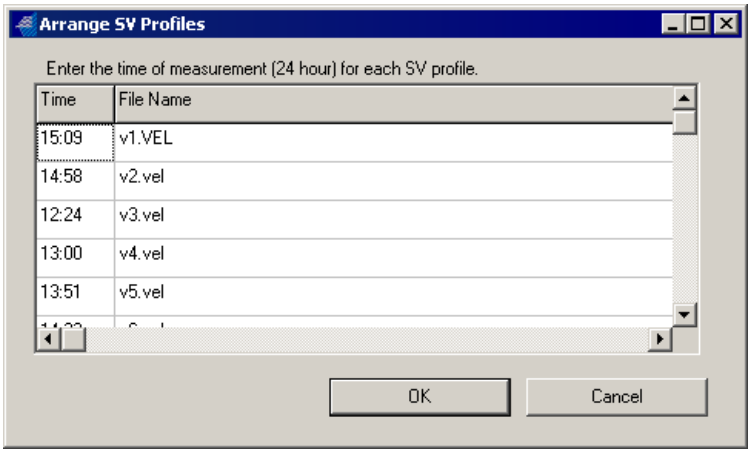
To assign different sound velocity files to individual data files within the catalog:

1. **Click [Open File] in the Sound Velocity Corrections section.** A File Select dialog will appear.
2. **Choose the VEL file (and other corrections) for the line displayed in the title bar** of the Corrections dialog
3. **Clear the 'Apply to all files in the catalog' option and** click [Open].
4. **Click [Next Line].** The title bar will display the next line name in the catalog.
5. **Repeat the process** until you have loaded a VEL file for each data file in your catalog.

To interpolate between multiple sound velocity files:

1. **Click [Open File] in the Sound Velocity Corrections section.** A File Open dialog will appear.
2. **Hold the Ctrl key and select each VEL file** for the day. (The program supports up to 48 files). Click [OK]. The Arrange SV Profiles dialog will appear listing each VEL file and the time based on the Windows® Date Modified field.

FIGURE 6-11. *Arrange SV Profiles Dialog*

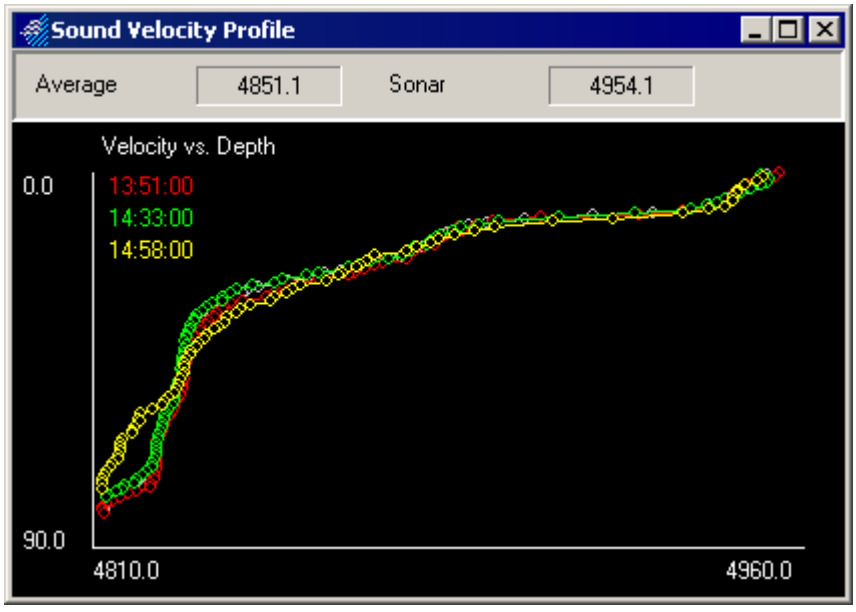


3. **Modify the times to reflect the time of the cast** where necessary.
4. Click [OK].

IMPORTANT! The corrections are assigned based on time so you should edit your data one day at a time.

When you load multiple sound velocity files the HYSWEEP® EDITOR calculates interpolated values based on the time tag of each ping. The Sound Velocity Profile window draws each sound velocity profile in a different color and graphs the interpolated values in white.

FIGURE 6-12. *Interpolating Between Multiple VEL Files*



If you have loaded multiple VEL files into the HYSWEEP® EDITOR, all of the information will be stored to the header of the saved HS2 files. If you later load these files back to the HYSWEEP® EDITOR, the results will be the same.

Later, in phase 2 editing of the HYSWEEP® EDITOR, if you suspect errors in the sound velocity profile, the Sound Speed Adjustment tool enables you to adjust your profile to remove the telltale 'smile' or 'frown' shape of your sounding swaths.

More Information

- "Sound Velocity Corrections" on page 4-4
- "Sound Velocity Corrections in HYSWEEP® SURVEY" on page 3-131
- "Correcting your Sound Velocity Profile with the Sound Speed Adjustment Tool" on page 6-58

EXTRACTING TIDE AND SOUND VELOCITY DATA

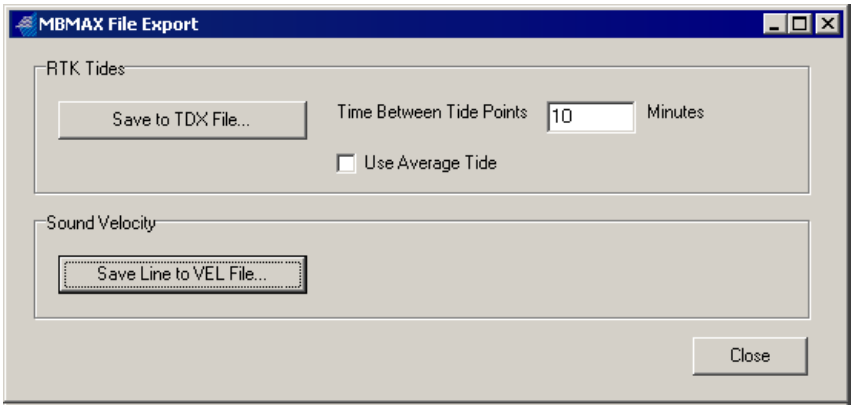
Tide and sound velocity corrections, recorded to the raw data files are saved to TID and VEL records respectively. They are applied to the sounding data based on the time stamps in each record.

The HYSWEEP® EDITOR Export dialog enables you to extract either the tide or sound velocity corrections from each data file loaded to the editor.

To Export Tide Data:

1. **Select the line from which you want to export the data** using the arrows in the HYSWEEP® EDITOR shell.
2. **Access the Export dialog** by selecting FILE-EXPORT.

FIGURE 6-13. *HYSWEEP® EDITOR Export Dialog*



3. **Set the time interval,** in minutes, that you want between each tide record in your exported file.
4. **Set how the exported value will be determined**.
   - **Use Average Tide** exports the mean value of the tides over the user-defined time interval.
   - **Without Use Average Tide**, it exports the tide value that occurs at the user-defined time interval.

5. **Click [SavetoTDX File...]** . The tide corrections data will be saved, by default, to the project folder with a TDX extension. You may then load the TDX file to the MANUAL TIDES program to generate a HYPACK® tide corrections file (*.TID) for use in other HYPACK® modules.

To Export Sound Velocity Corrections:

1. **Select the line from which you want to export the data** using the arrows in the HYSWEEP® EDITOR shell.
2. **Access the Export dialog** by selecting FILE-EXPORT.
3. **Click [Save Line to VEL File...].** The Sound Velocity data from the selected line will be saved, by default, to the project folder with a VEL extension.

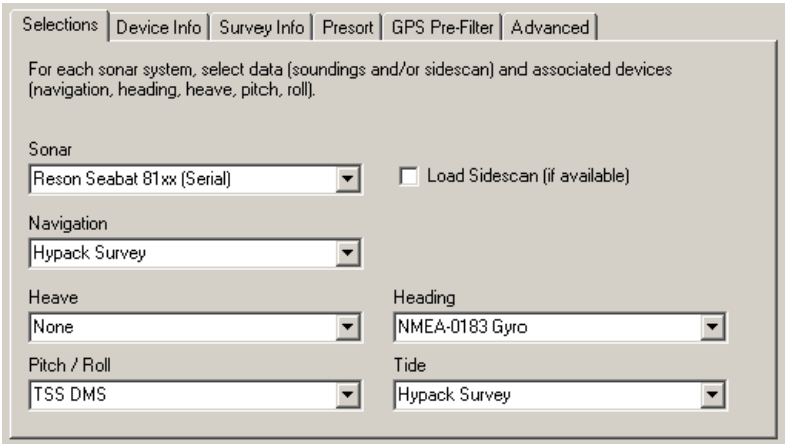
READ PARAMETERS IN THE HYSWEEP® EDITOR

The Read Parameters Dialog follows the Corrections Dialog. Set your options in each tab then click [Finish] to continue.

SELECTIONS TAB IN THE HYSWEEP® EDITOR READ PARAMETERS

In the Selections Tab, you select the devices to use for navigation, heading, heave and pitch/roll data, tide corrections and one or more devices to use for sounding data. If you have side scan data, load it by checking the 'Load Sidescan' box.

FIGURE 6-14. *Read Parameters-Selections Tab*



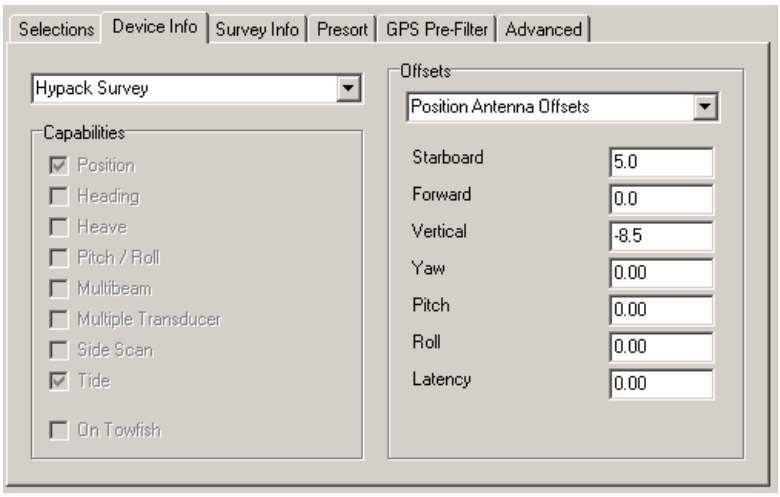
DEVICE INFORMATION IN THE HYSWEEP® EDITOR READ PARAMETERS

The Device Information tab displays settings for each device in your project. Select the device of interest from the drop-down box at the left. You can view the record capabilities that were set in the hardware configuration at the left, and view or modify the Offsets at the right. Any changes you make here will be applied to all currently selected files.

The drop-down list under 'Offsets' provides separate options for position and RTK Tide antenna offsets. This enables you to use separate systems for position and tide.

NOTE Editing the offsets will affect only the edited data. It will not affect raw data.

FIGURE 6-15. *Device Information Window*



SURVEY INFORMATION IN THE HYSWEEP® EDITOR READ PARAMETERS

The Survey Information tab displays some basic project information entered during SURVEY.

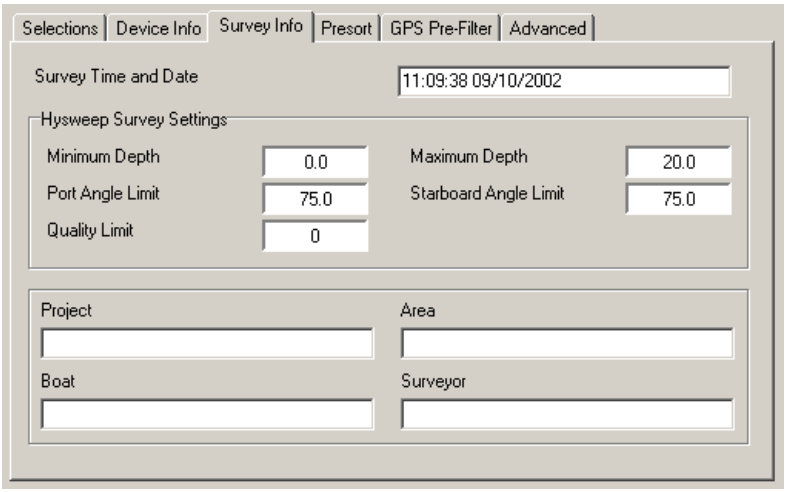
Min Depth deletes all soundings shoaler than the limit.

Max Depth deletes all soundings deeper than the limit.

Port and Starboard Angle Limits deletes data from transducers with a beam take-off angle greater than the specified limit.

The **Quality Limit** deletes all soundings with a quality number less than the limit.

FIGURE 6-16. *Read Parameters—Survey Information Tab*

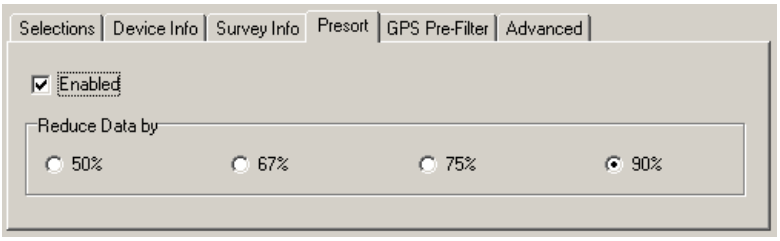


PRESORT TAB IN THE HYSWEEP® EDITOR READ PARAMETERS

If your data collection is too dense, the Presort dialog allows you to discard 1/2, 2/3, 3/4 or 9/10 of the collected sweeps.

To thin the data set somewhat, choose the percentage of data you feel you can discard and still maintain an accurate picture of your survey area.

FIGURE 6-17. *Read Parameters—Presort Tab*

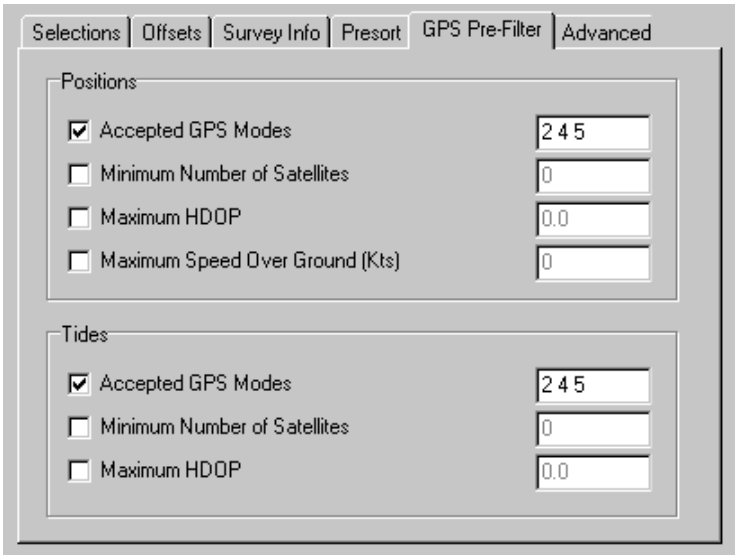


This is not our favorite method to reduce data sets. We prefer using the MAPPER program for this but, nevertheless, this option is still available.

GPS PRE-FILTER SETTINGS IN THE HYSWEEP® EDITOR

The GPS Pre-filter Tab options enable you to omit position and RTK tide data as it is read into the HYSWEEP® EDITOR. Any data that does not meet the criteria set in this tab will be edited out for you before anything is displayed in the data windows.

FIGURE 6-18. *GPS Pre-Filter*



Accepted GPS Modes: List GPS modes for which you want to read data. If the GPS mode does not match any of the specified values, the POS or TID record will be omitted from being read into the editor. Values may be separated by commas or spaces.

Minimum Number of Satellites: If the number of satellites recorded in the quality information is less than the user-specified number, the POS or TID record will be omitted from being read into the editor.

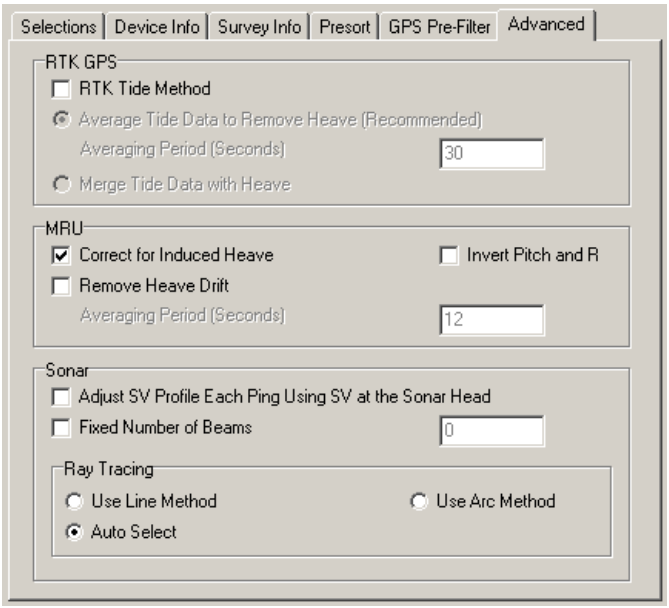
Maximum HDOP: If the HDOP recorded in the quality information is more than the user-specified number, the POS or TID record will be omitted from being read into the editor.

Maximum Speed over Ground (Kts): If the speed calculated ((pos2-pos1)/time) is more than the user-specified speed, the POS record will be omitted from being read into the editor.

ADVANCED READ PARAMETERS

The Advanced tab provides an opportunity to set preferences for RTK Water Level processing and Motion Reference Unit (MRU) options.

FIGURE 6-19. *The Advanced Read Parameters Tab*



The RTK Tides check box tells the program you want to calculate water level corrections using RTK GPS elevation. If this box is selected, the two items below it become active to specify the basis for the calculation. For RTK Tides to accurately determine water levels, you must have made a Kinematic Tide Data (*.KTD) file and used the Kinematic.dll device driver.

The **Average Tide Data to Remove Heave** method averages the RTK elevations over a user-specified Average Period to remove the effects of heave for the tide data.

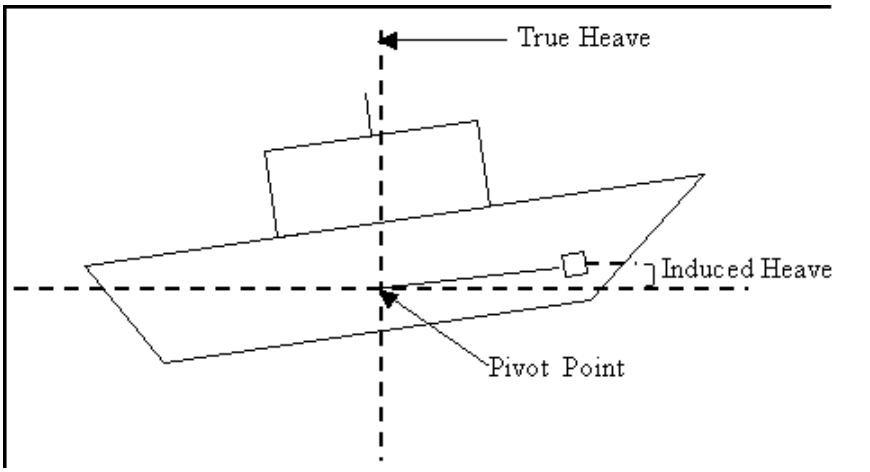
The **Merge Tide Data with Heave** method uses the RTK elevation as the starting point. It then uses the heave data received to determine the antenna height, until the next RTK elevation is received. The accuracy of your GPS latency setting affects the accuracy of this method.

Both methods give similar results. The averaging method seems to be preferable, particularly if your survey boat is in rough waters.

The MRU options let you specify how the heave information from a motion reference unit (MRU) will be applied.

Correct for Induced Heave is used when the MRU is not mounted at the survey vessel's pivot point. In this case, the heave measurement is affected by the pitch (if the MRU is mounted forward or aft of the pivot point) or roll (if it is mounted port or starboard). This is known as induced heave. A check in this box tells HYPACK® to determine a heave correction for every sounding to compensate for this difference.

FIGURE 6-20. *Induced Heave is caused when the MRU is not mounted at the pivot point of the boat*



Remove Heave Drift smoothes the heave in areas where it was affected by factors such as turning, acceleration and deceleration. This should not be necessary under ideal conditions and your helmsman takes care to:

- Turn the vessel outside of the survey area so that the vessel starts the line heading straight down line
- Drive at a constant speed while logging.

However, depending on where you are surveying, you may not have ideal conditions. Other boat traffic or obstructions mid-line may force you to pause and turn off line. This option attempts to normalize the heave.

This is a *mathematical approximation* of what the heave should have been. In such cases, your results will be better than if you use the exaggerated heave values or use heave equal to zero.

Invert Pitch and Roll: Typically this option will be cleared. It reverses a similar inversion that could be made in error in your motion sensor setup in HYSWEEP HARDWARE.

Adjust SV Profile Each Ping Using SV at the Sonar Head: Some sonars output a surface sound velocity correction value. This option replaces the first correction value in your sound velocity profile with the value supplied by the sounder.

Fixed Number of Beams accommodates echosounders that allow you to change the number of beams in use.

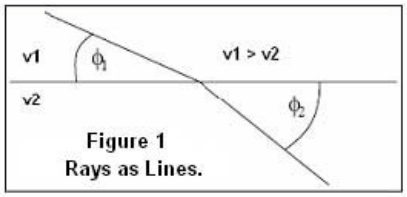
- If you have used this feature to limit the number of beams for the entire survey you can enter that number here.
- If you have used this feature during Survey, changing the number of beams one or more times, or if you are unsure how many beams were used, enter the maximum number of beams available in the system.

Ray Tracing is only important if your survey depths exceed 50 feet (15m). It determines the method the HYSWEEP® EDITOR uses to calculate the effect of refraction caused by changes in sound velocity. The

HYSWEEP® EDITOR offers two methods with which to calculate the path of the sounding beam:

- **Line Method** assumes the sound velocity in each layer is constant, which means the sounding beam is straight except at the transition between one sound velocity layer and the next. Although water doesn't behave this way, the calculation is twice as fast and it is a very good approximation when layer thickness is small. This method is recommended in water depth of 50 meters or less with velocity measurements spaced less than 2 meters apart.

FIGURE 6-21. *Line Ray Tracing*

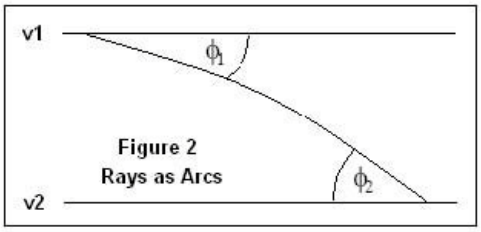


Select this option to force the HYSWEEP® EDITOR to use this method.

- **Arc Method** assumes a constant velocity change between V1 and V2. Then the ray path is an arc.

  Use this option when your soundings are deeper than 50 meters, or with velocity measurements more widely spaced than two meters.

FIGURE 6-22. *Arc Ray Tracing*



Select this option to force the HYSWEEP® EDITOR to use this method.

- **Auto Select:** This option automatically selects the most appropriate method according to your depths and the spacing of your sound velocity measurements.

WINDOWS IN THE HYSWEEP® EDITOR

Several windows are used through the three phases of multibeam editing. The HYSWEEP® EDITOR presents them in the phases during which

they are most useful, however you can display them at any time by selecting them through the View menu.

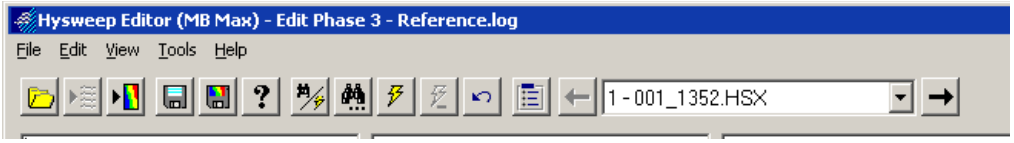
All of the displays are synchronized; click anywhere in the graphs and the cursor points in the other windows will update to coincide with the new position. You can use your mouse to reposition the cursor or use the arrow icons to scroll through your position points. The information in the status windows pertain to the current cursor point position.

Most procedures initiated from the many display windows are done with the click of an icon. Hold the cursor over any icon to display a short description.

THE HYSWEEP® EDITOR SHELL

The shell is the central control for the HYSWEEP® EDITOR. It provides the menu bar and a series of icons that provide shortcuts to several menu selections.

FIGURE 6-23. *HYSWEEP® EDITOR Shell*



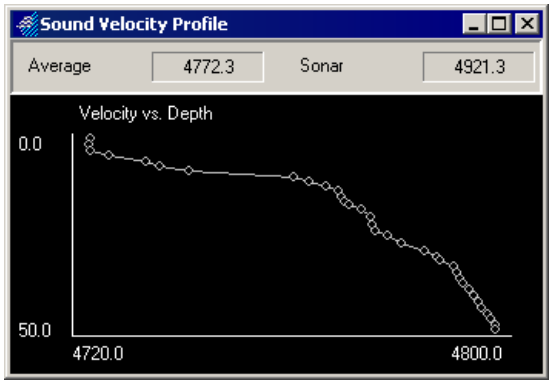
The title bar of the HYSWEEP® EDITOR shell displays the phase of the three-phase editing process in which you are currently working and the files you have loaded to the program.

The file currently displayed in the editing windows is shown in the field to the right. If you have loaded a catalog file, you can scroll through the files in the catalog by using the left and right arrows on the shell. Typically you would edit the first line then use the right arrow to move on to the next one.

SOUND VELOCITY PROFILE WINDOW IN THE HYSWEEP® EDITOR

The Sound Velocity Profile Window graphs the sound velocity corrections information, which is either embedded in the header of each raw multibeam data file (*.HSX) or contained in the VEL file (or files) loaded in the Corrections dialog. It shows velocity variation with depth. The average correction value from the profile and the sonar setting are shown in the status bar.

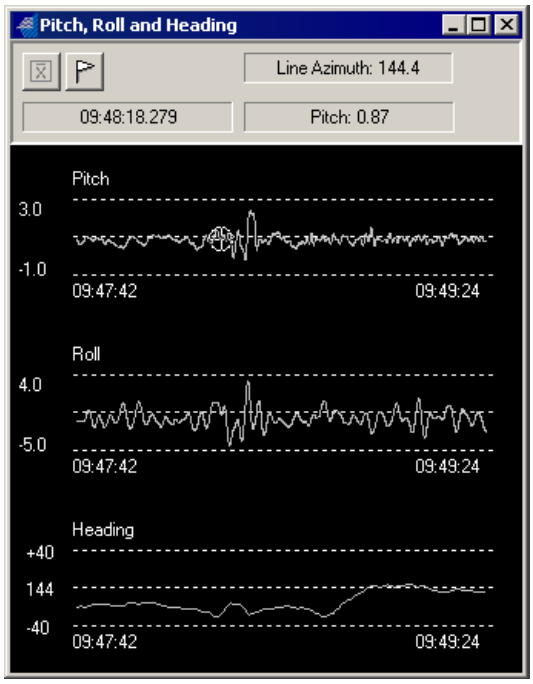
FIGURE 6-24. *Sound Velocity Profile Window*



PITCH, ROLL AND HEADING WINDOW IN THE HYSWEEP® EDITOR

The Pitch, Roll and Heading window appears during phase one of editing. It shows the pitch, roll and heading in time series. Comparing the heading graph with the navigation graph can show a gross error in gyro calibration. The graphs show a faulty sensor readily and give a good idea of wave dynamics at the time of the survey.

FIGURE 6-25. *Pitch, Roll and Heading Graphs*

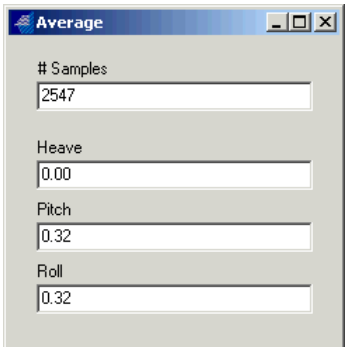


Position the cursor over any of the graphs. The Status Bar will display the Line Azimuth, Time and the value in the graph indicated.

To view the average heave, pitch and roll:

Click and drag a box around the portion of the data you want to know about and click the *Block Average* Icon. The Average dialog will display the number of samples and the average heave, pitch and roll values included in the time span defined by your box.

FIGURE 6-26. *Average Dialog*

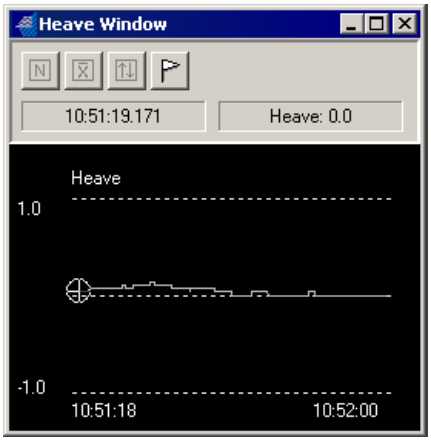


Pitch correction is applied at ping time (the same for all beams) and roll correction is at receive time (different for each beam) as you advance to Phase Two.

HEAVE WINDOW IN THE HYSWEEP® EDITOR

The Heave window shows heave, in time series format. The graphs readily show a faulty sensor and heave drift, and give a good idea of wave dynamics at the time of the survey.

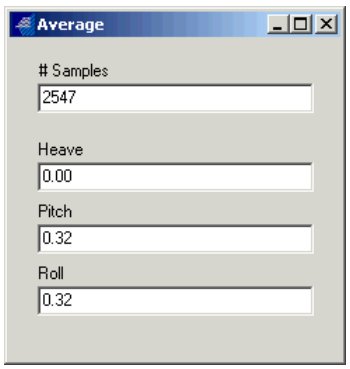
FIGURE 6-27. *Heave graph*



To view the average heave, pitch and roll:

Click and drag a box around the portion of the data you want to know about and click the *Block Average* Icon. The Average dialog will display the number of samples and the average heave, pitch and roll values included in the time span defined by your box.

FIGURE 6-28. *Average Dialog*

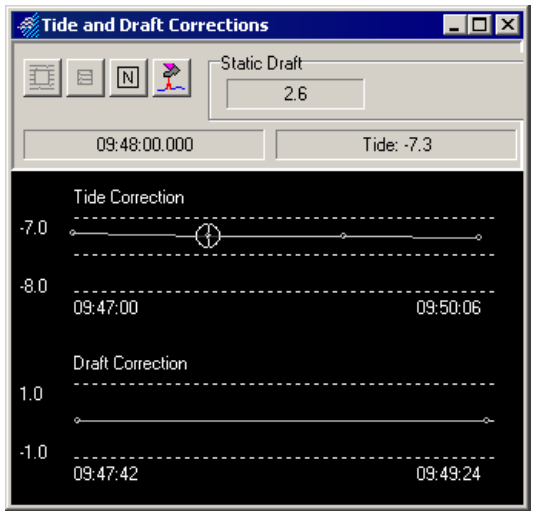


It is important to edit heave drift. This is typically found at the start and end of survey lines or where there are sharp curves in your survey lines. A survey boat traveling a bit too fast could create this effect.

TIDE AND DRAFT CORRECTIONS WINDOW IN THE HYSWEEP® EDITOR

The Tide and Draft Corrections Window appears by default in phase one. It shows tide and draft corrections in time series. The Tide and Draft graphs are independently editable.

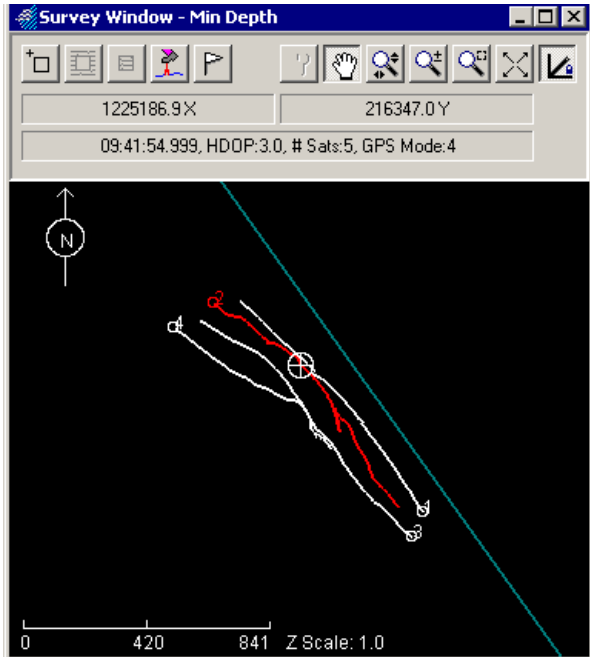
FIGURE 6-29. *Tide and Draft Corrections Window*



SURVEY WINDOW IN THE HYSWEEP® EDITOR (PHASE 1)

The Survey window displays a map view of your data files. You may choose to also display the corresponding charts, planned lines and track lines. The Survey window appears in phases one and three of the editing process. The status bar shows the XY coordinates, time and the QC statistics (HDOP, Number of Satellites and GPS Mode) to help guide editing decisions.

FIGURE 6-30. *Survey Window During Phase 1 Editing*



More Information

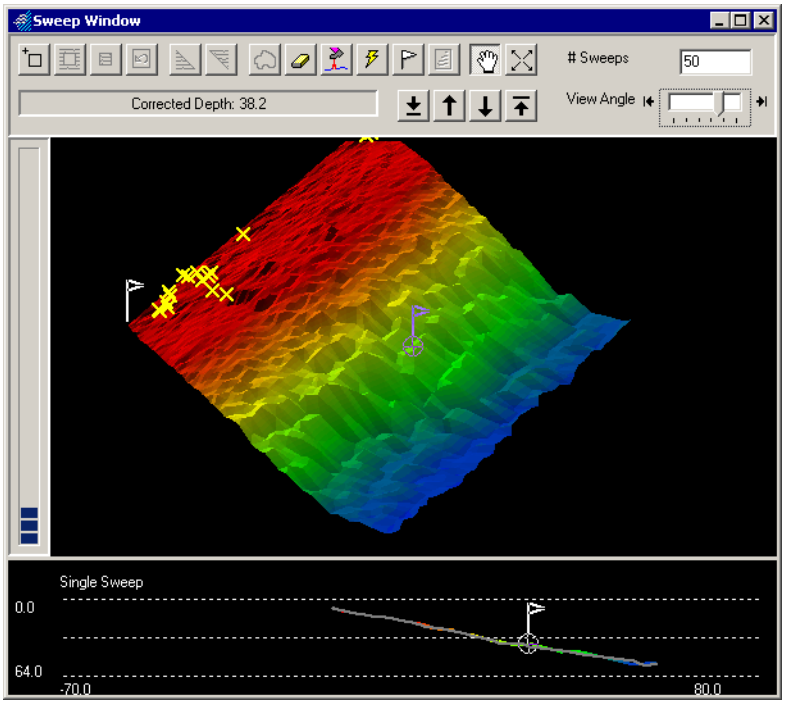
- "Survey Window Display Settings in the HYSWEEP® EDITOR" on page 6-35

SWEEP WINDOWS IN THE HYSWEEP® EDITOR

The Sweep windows show your data in map view. The top display shows several sweeps at a time according to the number of sweeps specified at the top right. The lower display shows one sweep at time. The cursor positions in these windows are synchronized to each other and with the other HYSWEEP® EDITOR windows.

You may want to view only one Sweep window, but some users felt it would be useful, at times, to view the same data from more than one angle at a time. The view angles in the Sweep windows can be changed independently of each other, while maintaining synchronized cursor positions.

FIGURE 6-31. Sweep Window



Use the **Rotate/Pan Tool** (hand icon) to adjust the positioning of your data in the display window.

Zoom in and out using your '+' and '-' keys respectively or with your mouse wheel.

The **Zoom Extents Icon** draws your entire data at the original orientation.

Use the **View Angle slider** to rotate the data for optimal viewing. The arrow buttons on each end of the slider quickly change the angle from 0 to 90 degrees.

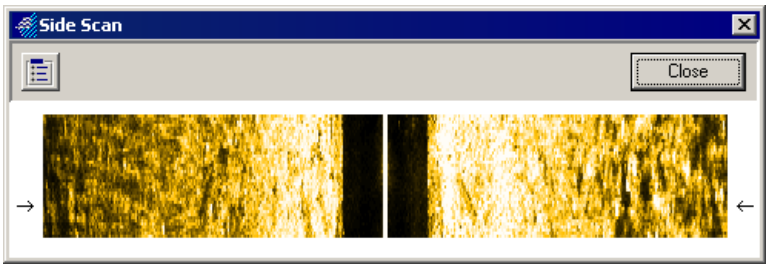
More Information

- "Sweep Window Display Settings in the HYSWEEP® EDITOR" on page 6-38

SIDE SCAN WINDOW

If you have loaded corresponding side scan data, you can view it by clicking the 'Show Side Scan' icon in the Sweep window. Arrows at either side of the side scan display indicate the current cursor position in the Sweep Window.

FIGURE 6-32. *Side Scan Window*



Display controls can be accessed through the icon in the Side Scan window to optimize this display.

All functions in this dialog are the same as in SIDE SCAN SURVEY. You can use the Color Preview window, which is displayed with the Side Scan Controls, to preview the effects of your display settings.

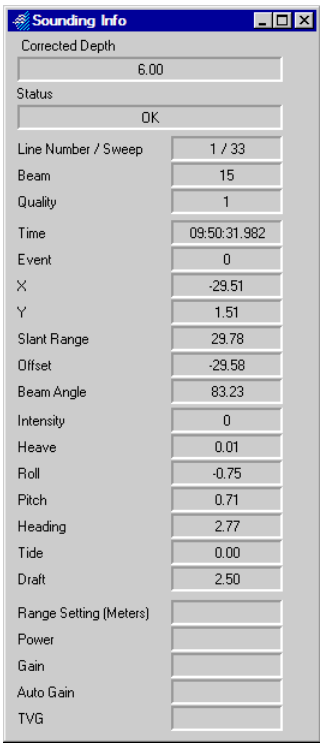
More Information

- "Setting Side Scan Mosaic Display Options" on page 5-18

SOUNDING INFORMATION WINDOW IN THE HYSWEEP® EDITOR

The Sounding Information window displays data about the point at which the cursor is positioned in the Sweep Window.

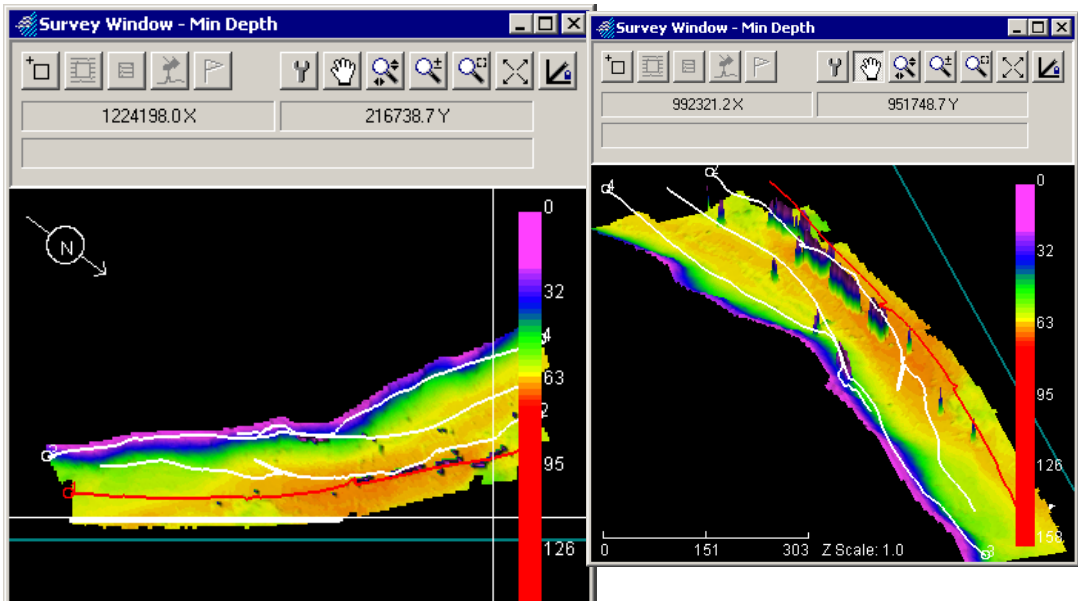
FIGURE 6-33. *Sample Sounding Information Window*



SURVEY WINDOW IN THE HYSWEEP® EDITOR (PHASE 3)

The Survey Window reappears in phase three of the editing process, displaying your soundings in a matrix.

FIGURE 6-34. *Survey Window in Phase Three Editing - Zoom Extents (left) and Rotated on two axes (right)*



You can block edit and point edit the soundings in the Survey window. In phase 3, Search and Filter Options are also useful to search out the last points that may need to be removed.

The display will be oriented in the Survey Window so the horizontal cross hair will always mark the location of the cross section viewed in the Profile Window.

Position the cursor by clicking anywhere in the graph. The cursors in the Profile and Cell Windows will update to coincide with the new position. The information in the status windows pertains to the current cursor position. You may also drag the cursor to measure the distance and azimuth between two points.

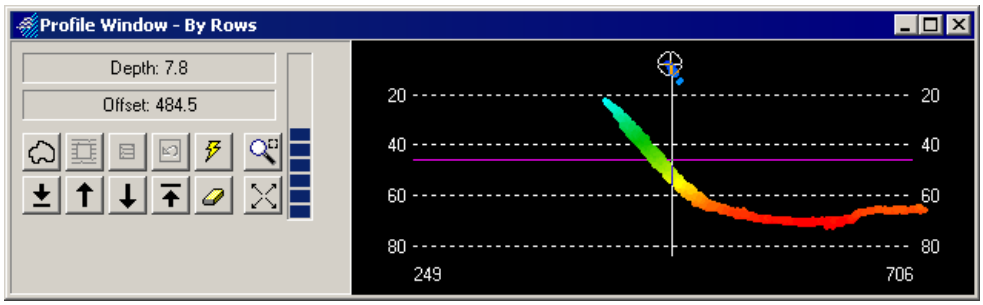
More Information

- "Survey Window Display Settings in the HYSWEEP® EDITOR" on page 6-35

PROFILE WINDOW IN THE HYSWEEP® EDITOR

The Profile Window displays cross sections of the sounding data. They are displayed by row or column in the matrix as designated in the Profile Tab in View Options. You may also set the colors to designate depth or survey line number or to appear in black and white in the View Options.

FIGURE 6-35. *Profile Window*



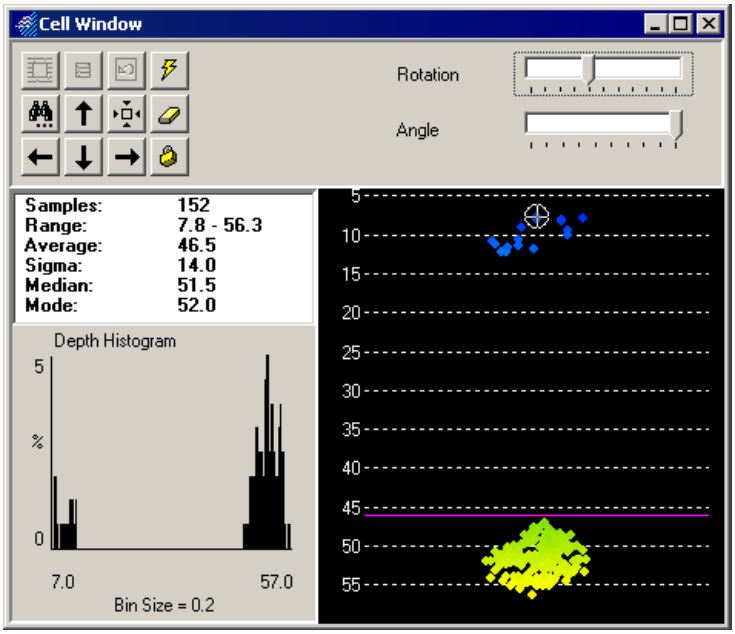
More Information

- "Profile Window Display Settings in the HYSWEEP® EDITOR" on page 6-37

CELL WINDOW IN THE HYSWEEP® EDITOR

The Cell window is used to view and edit edited survey data. It displays the data in the matrix cell corresponding to the cursor position in the Survey and Profile windows and which is defined in the status bars.

FIGURE 6-36. *Cell Window*



You can scroll through your data one matrix cell at a time using the arrow buttons. The displays in the Survey and Profile windows will update accordingly.

If you want to change the rotation and angle of the view, use the Rotation and Angle slides.

You can also view the data from the eight adjoining cells by clicking on the '**Include Neighboring Cells**' button. You can edit any data that is showing.

Statistics about the current cell are shown at the bottom left. They are automatically updated after any changes are made.

- **Samples:** The total number of soundings in the cell.
- **Range:** The minimum and maximum depths in the cell.
- **Average:** The average of the depths in the cell.
- **Sigma:** The standard deviation of the depths of the cell.
- **Median:** The median depth value of the cell.
- **Mode:** The mode depth value of the cell.

The Depth Histogram shows the percentage of readings at each depth reading. The bin size is defined below the graph.

More Information

- "Cell Window Display Settings in the HYSWEEP® EDITOR" on page 6-37

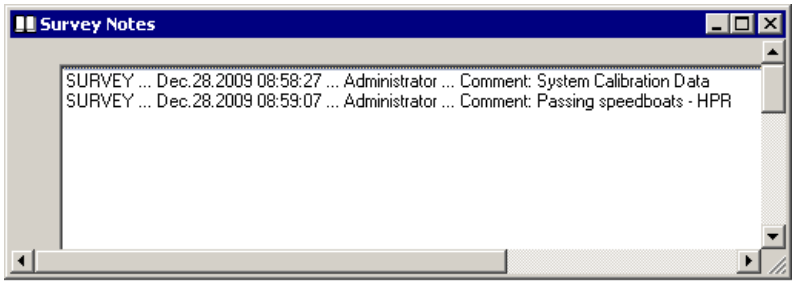
COMMENTS WINDOW

If you have recorded comments during SURVEY, you can display them and refer to them as you edit your data.

To view your comments log:

1. Load your survey data to the editor.
2. Select FILE - SHOW SURVEY NOTES. A separate window will display the comments logged in SURVEY.

FIGURE 6-37. *Sample Comments Display*



DISPLAY SETTINGS IN THE HYSWEEP® EDITOR

The view options in HYSWEEP® EDITOR determine what data appears in the display windows and howthe windows should be configured to optimize the display.

- The lighting controls can be used to position a light source--a virtual sun-- above the data displays.
- The settings in the **View Options** dialog determine how the data should be displayed. Each of the HYSWEEP® EDITOR windows is configurable to a certain extent. Range settings are adapted to expected bottom depths, display styles are selected to the operators personal preference and need.

POSITIONING A LIGHT SOURCE OVER YOUR DATA MODEL

To access the light controls, select VIEW-LIGHT CONTROLS.

The light is positioned, by default, directly over the data. However, you can reposition the light to simulate shadows which accentuate the contours in your data. This can be helpful in detecting small depth variations and anomalies.

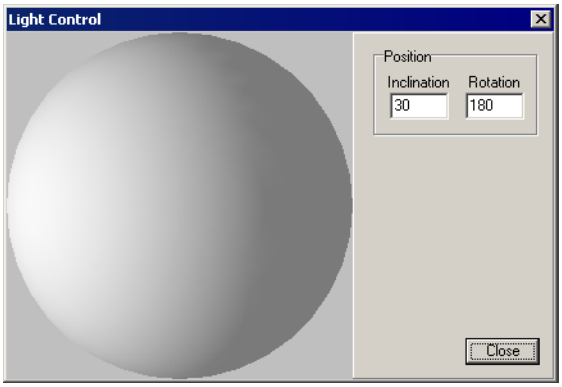
Two factors position the light:

- **Rotation** moves the light source horizontally around the data.
- **Inclination** adjusts the height of the light source from directly above to the level of the horizon.

To position the virtual light source:

1. **Open the Light Control dialog** by selecting VIEW-LIGHT CONTROL.

FIGURE 6-38. *Light Control Dialog*



2. **Set the direction and angle of inclination**.
   - **Type the Inclination and Rotation** in the corresponding text boxes.

TABLE 6-1. Inclination and Rotation Angles

Inclination	0	On horizon
	90	Directly above
Rotation	0	East
	90	North
	180	West
	270	South

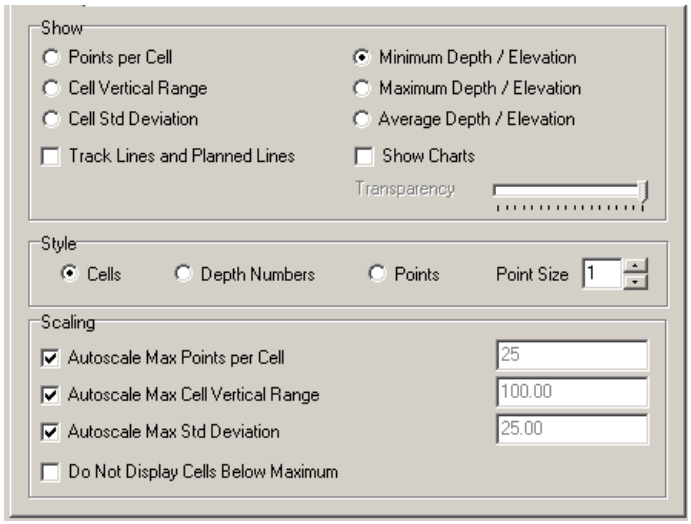
- **With your cursor**, click on the graphic at the location at which you want the light. The Rotation and Inclination values will automatically update accordingly.

The lighting effect will automatically update in your data model.

SURVEY WINDOW DISPLAY SETTINGS IN THE HYSWEEP® EDITOR

The Survey tab of the View Options dialog controls the Survey window display.

FIGURE 6-39. View Options—Survey Tab



The **Show options** define what data will be displayed. The sounding data can be accompanied by:

- **Track Lines** and **Planned Lines** superimposes the lines on the sounding display.
- **Show Charts** includes the project background files in the display.

Transparency affects the transparency of a chart that may be displayed with your sounding data. Typically there is nothing behind the chart that you might need to see, but it provides contrast between the background chart and the sounding data set that you are editing.

Style options define how the depth data is displayed in the Survey window.

- **Cells** fills the matrix cells with depth colors. This results in a solid model.
- **Depth Numbers** converts the color coded cells to numeric depth readings.
- **Points** displays one dot of the user-defined '**Point Size**' per matrix cell.

The **Scaling options** determine the size of depth range represented by each color. The HYSWEEP® EDITOR uses a constant number of colors and divides the range into that number. (The wider the range results in more depth values represented by the same color.) Scaling can be based on:

- Points per Cell
- Cell Vertical Range
- Cell Standard Deviation

NOTE: Your scaling option must correspond to the selected 'Show' option.

The scaling can be manual or automatic.

'**Autoscaling'** will use the minimum and maximum values and evenly distribute the colors across that range. It will create the optimal settings unless you have values that are drastically out of range.

Manually scaling: Enter the maximum value for your scale basis. the HYSWEEP® EDITOR will scale the colors from zero to your specified maximum. Additionally, you may exclude the soundings less than the specified maximum by checking '**Do Not Display Cells Below Maximum**'.

In addition to the View Options dialog, the Survey window includes a few extra tools to adjust your display.

- **Zoom in and out** using your '+' and '-' keys respectively or with your mouse wheel.
- The **Zoom Extents** draws your entire data at the original orientation.

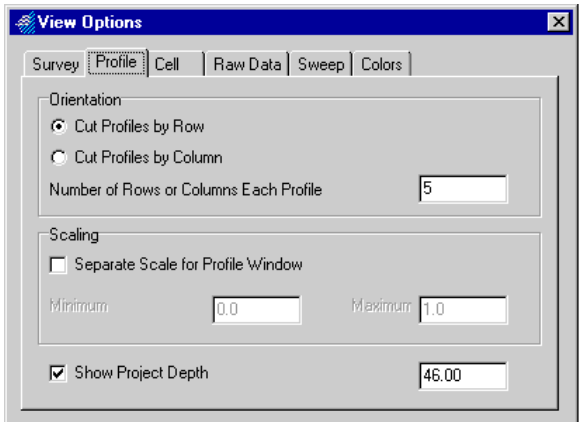
- The **Rotate and Pan Tool** (hand icon) adjusts the positioning of your data in the display window.
- The **Lock 3D Axis** maintains the display in map view while you can rotate the model around the cursor position.

NOTE: When you are using these tools, only the track lines and cursor are visible. The data model will only draw when the display is static.

PROFILE WINDOW DISPLAY SETTINGS IN THE HYSWEEP® EDITOR

The Profile options control the display in the profile window.

FIGURE 6-40. *View Options—Profile Tab*



Define which way in the matrix the cross section is cut to be displayed in the Profile window and the number of matrix rows or columns in each profile. If you cut profiles by column, the display in the Survey Window will rotate 90 degrees so the horizontal cross hair will always mark the location of the cross section viewed in the Profile Window.

Scaling enables you to set a depth range specifically for the Profile Window. If this set of options are not selected, the Profile Window will be scaled according to the Depth/Elevation scale settings for the Survey and Cell windows (Autoscale Depth/Elevation options).

Show Project Depth draws a line at the user-defined level in the Profile Window.

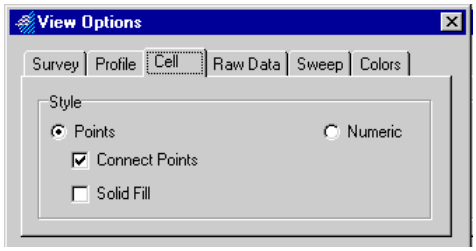
CELL WINDOW DISPLAY SETTINGS IN THE HYSWEEP® EDITOR

The Cell tab presents options primarily affecting the Cell Window.

Connect Points makes a mesh display by connecting the points with straight lines to form triangles.

Solid Fill shades the triangles formed by the connected points in gray. This is only an option if the points are connected.

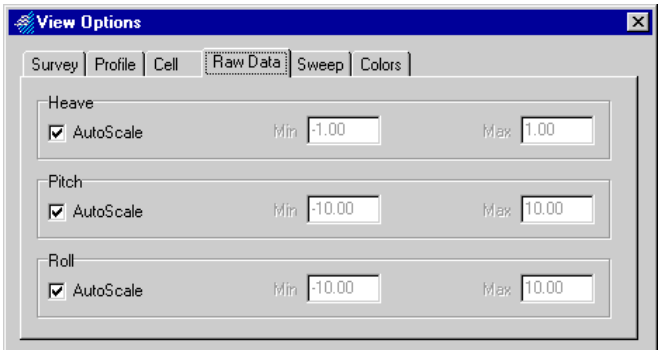
FIGURE 6-41. *View Options—Cell Tab*



RAW DATA DISPLAY SETTINGS IN THE HYSWEEP® EDITOR

The Raw Data tab sets the scale of the heave, pitch and roll graphs. Autoscaling will show the total range of the data or you can define your own display range for each graph.

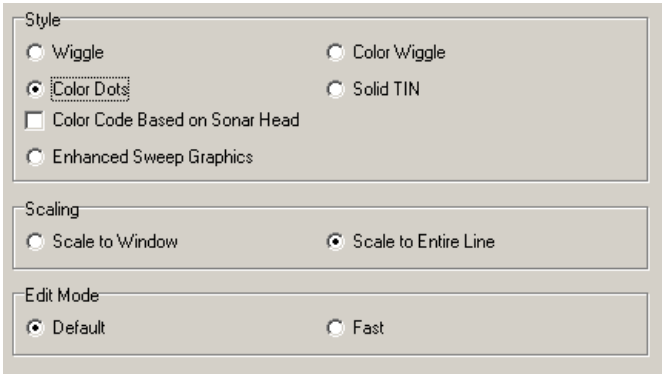
FIGURE 6-42. *View Options—Raw Data Tab*



SWEEP WINDOW DISPLAY SETTINGS IN THE HYSWEEP® EDITOR

The Sweep tab presents options affecting the Sweep Window.

FIGURE 6-43. *View Options—Sweep Tab*

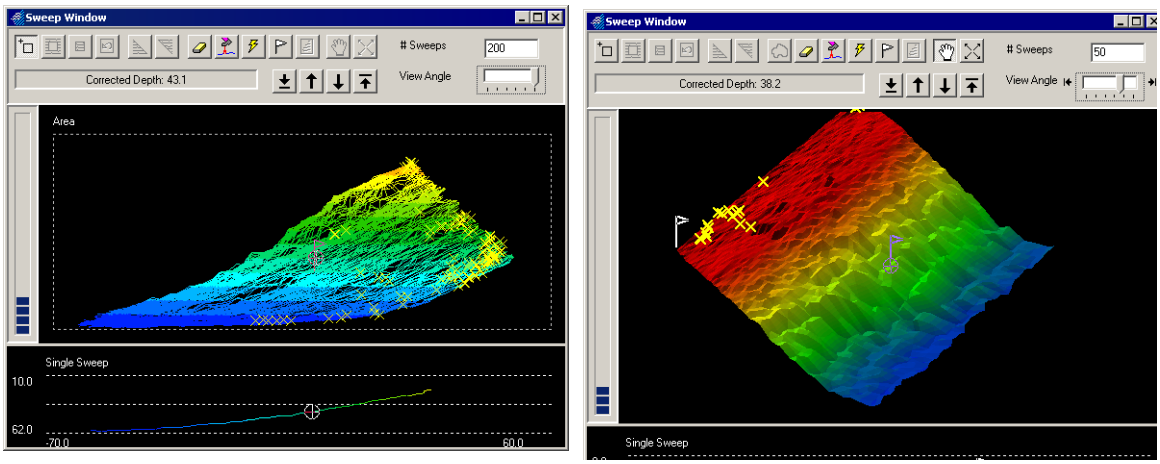


Style:

- **Wiggle** and **Color Wiggle** draw one line per sweep. Wiggle is in black and white, Color Wiggle is color coded according to the depths it represents.
- **Color Dots** displays a series of circles color-coded according to the depth. (This option replaces the 'Depth Colors' option in HYPACK® 2008.)
- **Solid TIN** creates a solid shaded, 3-dimensional picture.
- **Color Code Based on Sonar Head** draws data from one head in green and data from the other head in red.

- **Enhanced Sweep Graphics** draws a more realistic-looking model and allows you to rotate the model to any orientation.

FIGURE 6-44. *Sweep Window Color Wiggles (left) and Enhanced (right)*



Scaling:

- **Scale to Window** scales to the current sweep displayed.
- **Scale to Entire Line** scales the window to the depth range of the line (not the sweep).

Editing Mode: This option determines how the block and line editing tools work.

In addition to the View Options dialog, the Survey window includes a few extra tools to adjust your display.

- The **Rotate and Pan Tool** (hand icon) adjusts the positioning of your data in the display window. Shift + Click toggles between the default cursor and the Rotate and Pan tool.
- **Zoom in and out** using your '+' and '-' keys respectively or with your mouse wheel.
- The **Zoom Extents Icon** draws your entire data at the original orientation.

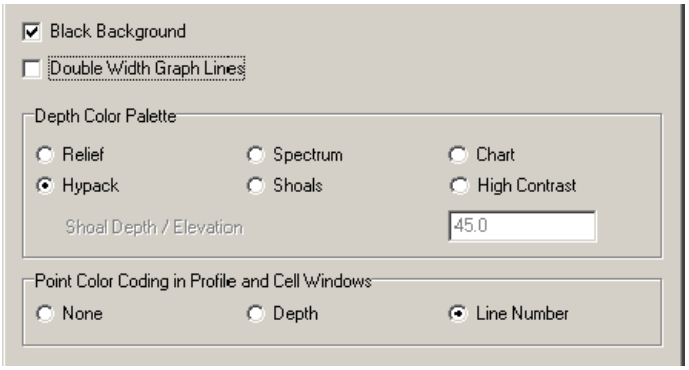
More Information

- "Editing Data in the HYSWEEP® EDITOR" on page 6-48

COLOR SETTINGS IN THE HYSWEEP® EDITOR

The Colors Tab determines the depth color settings for all of the displays.

FIGURE 6-45. *View Options—Colors Tab*



Choose between a black and white background, and between single or double lines in the graphs.

You can choose from a number of color palettes to color code the soundings.

- **Relief** uses the color schemes common to relief maps.
- **Spectrum** uses a rainbow color spectrum.
- **Chart** uses the color schemes common to nautical charts.
- **HYPACK®** uses the project color settings.
- **Shoals** displays red where the soundings are shoaler than the specified Shoal Depth.
- **High Contrast** uses a color selection designed to clearly distinguish one depth band from the next.

Point Color Coding in Profile and Cell Windows:

- **None** shows the data in black and white.
- **Depth** shows the data in color settings according to the depths.
- **Line Number** uses different colors to differentiate between survey lines. The colors repeat every 7 lines.

OTHER VIEW OPTIONS IN THE HYSWEEP® EDITOR

A few options are included at the bottom of the dialog, regardless of which tab has been selected.

Autoscale Depth/Elevation can be selected to automatically set the depth range in the Sweep, Profile and Cell windows according to the depth range of the data. The legend in the Survey window is also scaled to fit these settings. To manually set the scale of these windows, deselect this option and enter the minimum and maximum depths/elevations that you want to use.

Show Active Filters displays yellow X's, during phase two and three, where data points are out of the range allowed by the search and filter options.

Show Deleted Points displays red X's, during phase two and three, where data points have been removed.

Use Graphics Accelerator The combination of Windows® Vista or Windows® 7 with certain video cards causes some of the graphics displays to draw improperly. This is most noticeable in the Sweep window of phase 2 editing: the areas behind the X's marking filtered or deleted points, and areas defined by clicking and dragging the cursor show black. If this is the case, check this option.

[Filter Options] brings up the Search and Filter Options dialog.

[Apply] enables you to preview the effects of your settings on the window displays before the dialog is closed.

More Information

- "Search and Filter Options in the HYSWEEP® EDITOR" on page 6-42

OVERLAYING A CHANNEL PLAN FILE IN THE HYSWEEP® EDITOR

Select FILE-OVERLAY CHANNEL PLAN to display Channel Plan files (*.CHN), from ADVANCED CHANNEL DESIGN or CHANNEL DESIGN, in the Survey, Sweep and Profile windows of the HYSWEEP® EDITOR. It can be helpful to use it as a guide in your editing process.

NOTE Channel Plan files (*.PLN) created in CHANNEL DESIGN may be converted to *.CHN format in the ADVANCED CHANNEL DESIGN program (select FILE-PLN TO CHN). This enables you to overlay template information from files created in CHANNEL DESIGN.

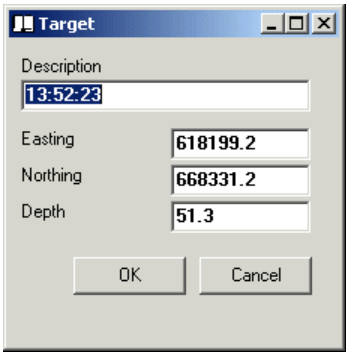
CREATING TARGETS IN THE HYSWEEP® EDITOR

As you view your data in the various windows of the HYSWEEP® EDITOR, you can create a target to mark some point of interest.

1. **Select the point where the target should be placed and press F5.** The first time in each session you mark a target, a File Select dialog will appear.
2. **Name your file**.
   - **If you are creating a new target file**, provide a name and click [OK].

- **If you want to add to an existing target file**, select the file from your project folder and click [OK].
  A Target dialog will appear for you.

FIGURE 6-46. *Target Dialog*



3. **(Optional) Edit your Target Name and Position information** and click [OK]. The target will be saved to your target file and displayed in the HYSWEEP® EDITOR editing windows.

NOTE: Be careful if you are editing the Easting and Northing, an error in typing could place it outside of your survey area!

When you exit in the HYSWEEP® EDITOR, the target file can be displayed in the HYPACK® map window and used as any other target file.

SEARCH AND FILTER OPTIONS IN THE HYSWEEP® EDITOR

Open the Search and Filter Options dialog by selecting EDIT-SEARCH AND FILTER OPTIONS (Ctrl+F).

Use these settings to mark soundings for your evaluation during Phase Two and Three of editing or to delete those soundings in cursory, automatic editing process.

To mark soundings that fall outside the Search and Filter options, check the 'Show Active Filters' option in the View Options dialog (F9). Yellow X's mark soundings that fall outside the filter criteria.

To delete all points that fall outside the filter limits set by the Search and Filter Options, click [Run Filters]. (This is the equivalent to the Filter All button in the main toolbar.)

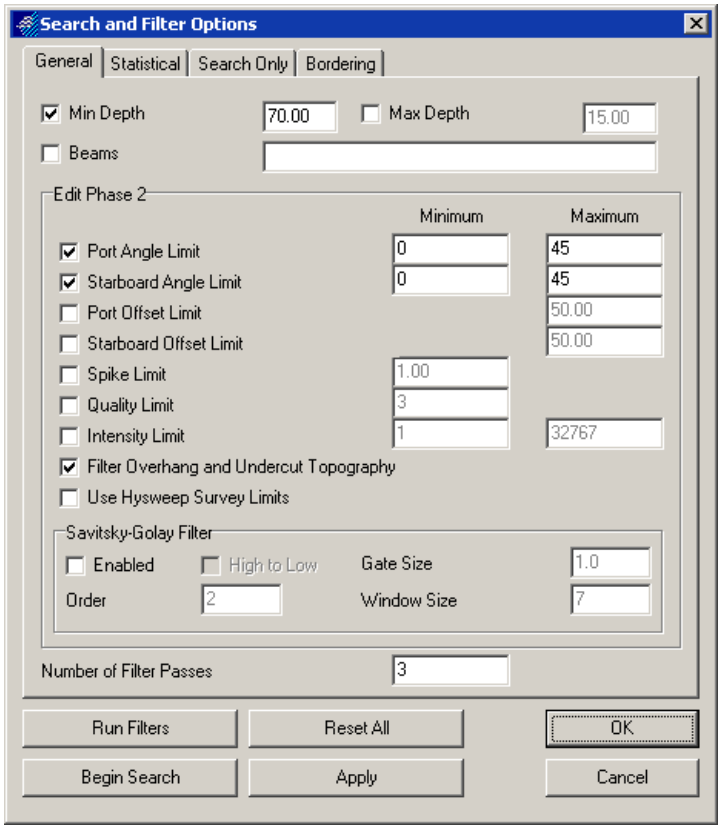
Beware!

BEWARE! It's fast! It's easy! *It's DANGEROUS!!!* No computer program can replace human intelligence and common sense when it comes to editing data. *Use this feature with caution!*

GENERAL FILTERS IN THE HYSWEEP® EDITOR

Options in the General Tab enable you to search and filter data based on certain user-defined limits on sounding values, beam angles, quality readings and bottom topography.

FIGURE 6-47. *Search and Filter Options Dialog*



The **Min Depth/Elevation filter** (Phase 2 and 3) deletes all soundings shoaler than the limit.

The **Max Depth/Elevation filter** (Phase 2) deletes all soundings deeper than the limit.

Beams (Phase 3) enables you to filter out all readings from selected beams. List beams to be omitted. The numbers should be space delimited.

Port and Starboard Angle Limits (Phase 2) deletes data from transducers with a beam take-off angle within the specified range.

Port and Starboard Offset Limits (Phase 2) deletes all data that falls outside of the user-defined distance from the center beam.

Spike Limit traverses the soundings in blocks of 16 (4 beams x 4 sweeps) and deletes soundings deviating from the 16 point average by more than the limit.

The **Quality Limit** (Phase 2) deletes all soundings with a quality number less than the limit.

The **Intensity Limit** deletes all soundings with an intensity value outside of the user-defined range.

Maximum Bottom Slope (Phase 2) deletes all soundings where the slope from the previous sounding exceeds the limit.

Beware!

BEWARE! Watch this setting when your data includes side slopes. You could delete good data.

Filter Overhang and Undercut Topography (Phase 2) deletes stray soundings that would create these topographical features.

Number of Filter Passes repeats the filtering process according to the number of times entered. This is supposed to improve the filtering, but the degree of improvement is not what was anticipated.

Use HYSWEEP® SURVEY Limits: The depth and angle limits that are set in HYSWEEP® SURVEY are recorded in the headers of the raw data files and the HS2 edited files. Click this button and the HYSWEEP® EDITOR will read the values from the header of the selected files and mark the data that was filtered during SURVEY as filtered in the HYSWEEP® EDITOR. The data will remain present until you use the filters to remove it.

Savitsky-Golay Filter is a low pass filter that:

- Removes data appearing as high frequency (abrupt bottom changes, outliers)
- Keeps low frequency data (somewhat uniform) seafloor.

Beware!

BEWARE! USE WITH CAUTION! This filter was designed for use with excessively noisy data and is *not intended as a substitute for thoughtful editing*. All automated filters carry some risk of inaccurately removing bottom features.

The filter reads a number of soundings specified by the **Window**. It estimates the actual depth of the center point of that range by doing a series of calculations based on the **Order**. If the original depth is deeper or shoaler than the calculated depth by more than the **Gate** value, it will be removed by the filter.

Depth Removed	Original depth < Calculated depth - Gate Value Or Original depth > Calculated depth - Gate Value
Depth Kept	Original depth > Calculated depth - Gate Value And Original depth < Calculated depth + Gate Value

High to Low: The intention is to detect the largest data spike, remove it then, recalculate the filter, etc. thereby removing less good points with the bad.

Beware!

BEWARE! The idea is good, but it can be unreliable. Under certain conditions it can remove too much data. *Use cautiously!*

The **Order:** Degree of polynomial approximation. It should always be less than the Window size. After that, you will have to experiment in each survey condition to determine the best order for you. A larger order filters less which results in a more varied surface, but may not remove all extraneous data.

Gate Size: Depth, in survey units, above and below the filtered surface. Depths outside of this range will be removed.

Window: Number of soundings used to estimate the surface. Should be an odd number.

FIGURE 6-48. *Order of 2 creates a straight line through the data. Assumes very flat bottom.*

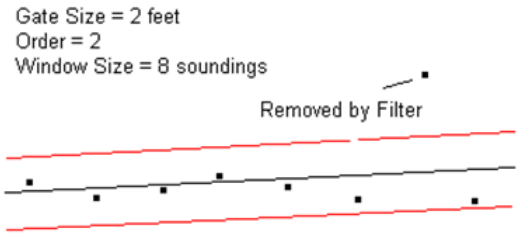
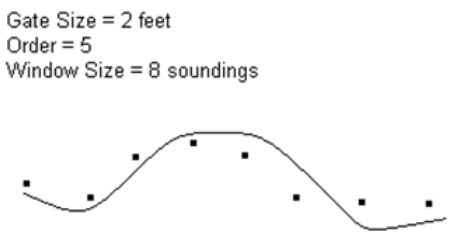


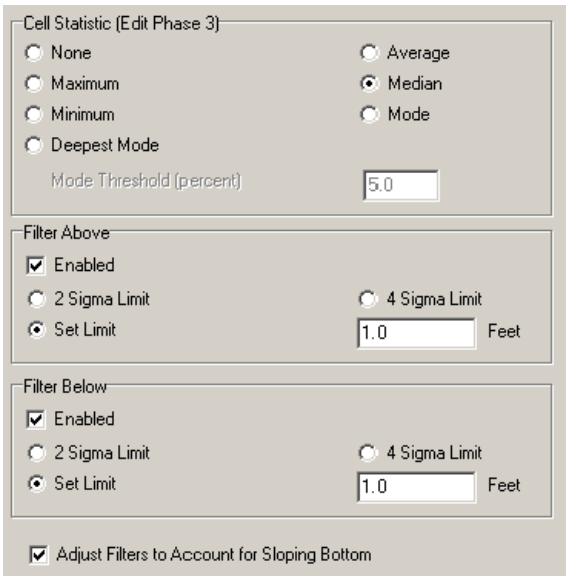
FIGURE 6-49. *Order of 5 allows for some bottom variation.*



STATISTICAL FILTERS IN THE HYSWEEP® EDITOR

The Statistical Tab is used by the HYSWEEP® EDITORin phase three editing when the data has been gridded to a matrix. It finds the sounding statistic value in each cell as defined by the Cell Statistic option. It then refers to the Filter Above and Filter Below options to search out or delete data outside of the specified ranges from that value.

FIGURE 6-50. *Search and Filter Options—Statistical Tab*



Most of the Cell Statistic options are self-explanatory.

'**None**' disables this filtering method.

Deepest Mode can be helpful in removing stray points from thick vegetation. It removes a user-defined percentage of the soundings in each cell of your matrix. The points removed will be the shoalest found in each matrix cell until it has removed the percentage of soundings specified. For example, if you have 100 soundings in each matrix cell and you specify 5%, the filter will remove the 5 shoalest soundings, assuming they are outliers.

The Median value, with equal number of soundings greater and smaller, is usually the best choice for the cell statistic.

The **Filter Above** and **Filter Below** settings, either one or both, can be enabled to delete data of significant difference from the cell statistic. You will choose the limit that defines good vs bad data.

2 Sigma Limit: Two standard deviations from the cell statistic is dangerous as it can result in the deletion of a lot of good data.

4 Sigma Limit: Four standard deviations from the cell statistic is pretty safe, but it's still a good idea to search and manually edit the data instead of blindly filtering all of the data.

Set Limit enables you to set a customized limit.

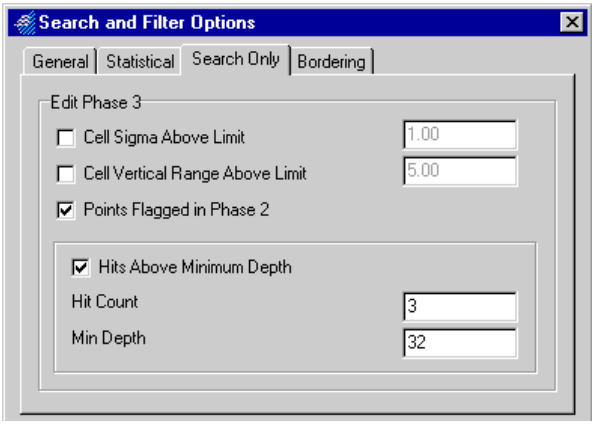
Start with one foot in soft bottom surveys, and 3 feet in rock conditions.

Adjust Filters to Account for Sloping Bottom: Sloping bottoms can skew statistical calculations. If you are surveying over slopes, check this box and the program uses algorithms that make the statistics more meaningful.

SEARCH ONLY CRITERIA IN THE HYSWEEP® EDITOR

As the tab name "Search Only" says, these options are for search purposes only. These options are available only in Phase 3 editing and will not cause any data to be deleted if you filter your files.

FIGURE 6-51. *Search and Filter Options—Search Only Tab*



Cell Sigma Above Limit: A large distribution of data would be suspect and result in a large sigma value. This option enables you to search out any cell with a standard deviation greater than a user-defined limit.

Cell Vertical Range Above Limit: This option enables you to search out any cell with a depth range greater than the user-specified limit.

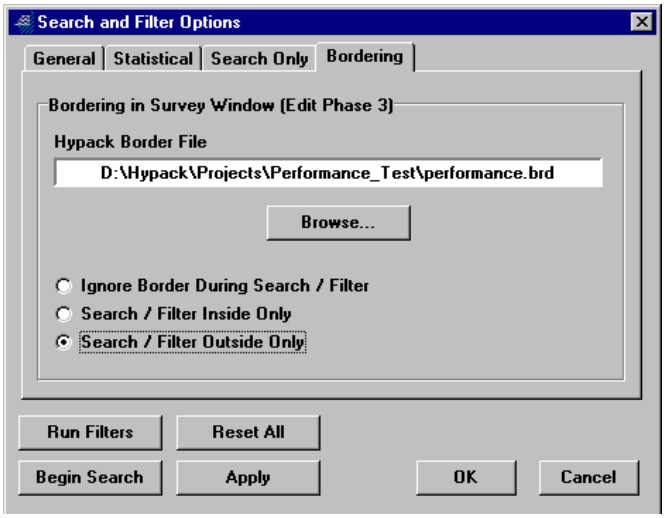
Points Flagged in Phase 2 searches during Phase 3 for any point that was marked with the flag icon during Phase 2 editing. You can then view the same point in the Cell, Profile and Survey windows to make your editing decision.

Hits Above Minimum Depth finds all cells where the number of soundings above the **Minimum Depth** exceeds the **Hit Count** where the Minimum Depth and Hit Count are user-defined values.

BORDERING FILTERS IN THE HYSWEEP® EDITOR

In Phases Two and Three of editing multibeam data, you may search your entire data set or confine the search to a area defined by a Border File. The Bordering Tab tells the HYSWEEP® EDITOR whether these search and filter settings should be applied inside the border, outside the border or to all data (Ignore Border).

FIGURE 6-52. *Bordering Filters in the HYSWEEP® EDITOR*



You can create a Border File in the BORDER EDITOR to define an area in the survey area. The Bordering dialog tells the HYSWEEP® EDITOR what Border File to use and whether the Search and Filter settings should be applied inside the border, outside the border or to all data (Ignore Border) during Phase 3 editing.

EDITING DATA IN THE HYSWEEP® EDITOR

The HYSWEEP® EDITOR presents select windows during each of three editing phases.

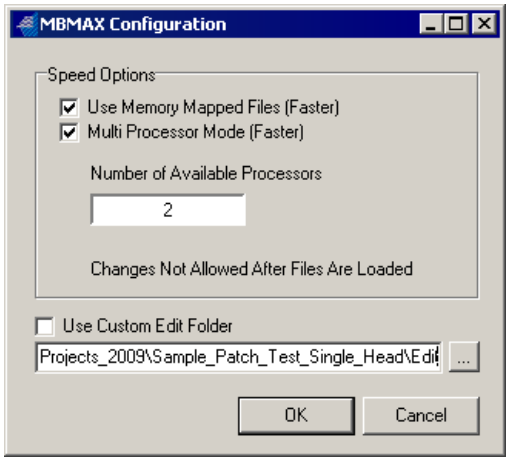
- **Phase one** provides limited editing of tracklines and corrections data.
- **Phase two** is where you clean most of the bad data.
- **Phase three** provides additional tools with which you can 'fine tune' your editing decisions.

As you progress enter each phase, statistical information appears in the lower portion of the editor shell:

- **Load Time:** Time to load selected data to phase 1.
- **Phase 1->2 Time:** Time to transition from phase 1 to phase 2.
- **Phase 2->3 Time:** Time to transition from phase 2 to phase 3.
- **XYZ Count:** Number of soundings loaded to phase 3.
- **MTX Cell Count:** Number of cells in the matrix used in phase 3.
- **Cell Size:** Matrix cell dimensions.

If your computer has the power, the load and transition times can be significantly improved by selecting TOOLS-MBMAX CONFIGURATION and checking the Speed options in the Configuration dialog.

FIGURE 6-53. MBMax Configuration Dialog



STANDARD EDITING OPERATIONS IN HYSWEEP® EDITOR

Some 'standard' editing operations are available in all three phases, though not necessarily in every window. You can tell what type of editing operations are allowed in each window by the tools included in each.

STANDARD POINT EDITING

Each phase also offers point editing where you delete one point at a time.

1. **Select the point with the cursor**.
2. **Click the Delete Point icon** (or the Delete key).

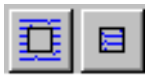
STANDARD BLOCK EDITING

Block Editing has two modes: Default and Fast Editing. The mode setting is in the Sweep tab of the View Options dialog.

- In **Default Mode**, the editing is a two-step process.

To edit a block in Default Mode:

a. **Select the Default Mode** in the Profile tab of the View Options dialog.
b. **Depress the Block Mode Icon** (M).
c. **Select a block of data points** by dragging your cursor from one corner to the diagonally opposite corner. (If you're unhappy with the results, just try again.)
d. **Edit the Data** by clicking the Delete Inside Block (I) or Delete Outside Block (O) icon.



To edit above or below a line in Default Mode:

a. **Select the Default Mode** in the Profile tab of the View Options dialog.
b. **Release the Block Mode Icon** (M).
c. **Draw a single-segmented line between your good and bad data**.
d. **Click the 'Delete Above Line' (A) or the 'Delete Below Line' (B) icon** according to what data you want to remove.

To edit above or below a line in Fast Mode:

- In **Fast Mode**, you set what data to delete (inside/outside the box and above/below the line) first. This frees you to do multiple edits in succession.

To edit a block in Fast Mode:

a. **Select the Fast Mode** in the Profile tab of the View Options dialog.
b. **Depress the Block Mode Icon** (M).
c. **Select a block of data points** by dragging your cursor from one corner to the diagonally opposite corner. The program will automatically delete the points that fall inside the block.

To edit with a line in Fast Mode:

a. **Select the Fast Mode** in the Profile tab of the View Options dialog.
b. **Release the Block Mode Icon**.
c. **Draw a single-segmented line between your good and bad data**. The program will automatically delete all points that lie above the line.

To abort a delete operation in Fast Mode:

Click the Escape key on your keyboard before releasing the mouse button.

RESTORING DELETED POINTS

When you delete soundings in the HYSWEEP® EDITOR, regardless of which method you use, the soundings are not really removed from the data file. Instead they are flagged as deleted. There are multiple methods you may use if you decide you have deleted soundings in error.

TIP: If you select the 'Show Deleted Points' in the View Options dialog, each deleted point is marked with a red 'X'. When you restore a sounding, its red 'X' disappears.

To restore a single point:

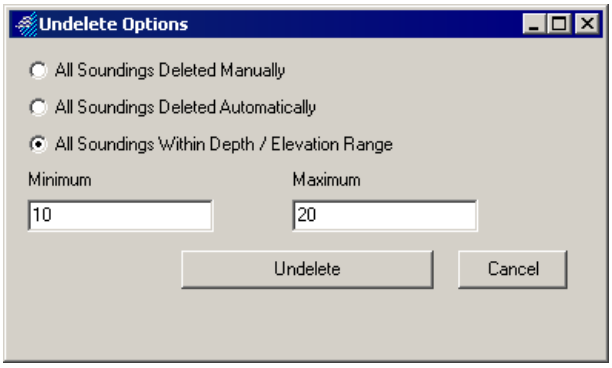
1. **Select the point with your cursor**.
2. **Click Shift + Delete** and the point will be restored.

You can also restore specific groups of soundings through the Undelete Options dialog.

To restore multiple points:

1. **Select EDIT-UNDELETE** and the Undelete Options dialog will appear.

FIGURE 6-54. Undelete Options Dialog



2. **Select which group of soundings** you want to restore.
   - **All Soundings Deleted Manually** using the cursor and delete buttons.
   - **All Soundings Deleted Automatically** using filter options.
   - **All Soundings within Depth/Elevation Range:** Define the depth/elevation range within which you want to restore all soundings.
3. **Click [Undelete]**.

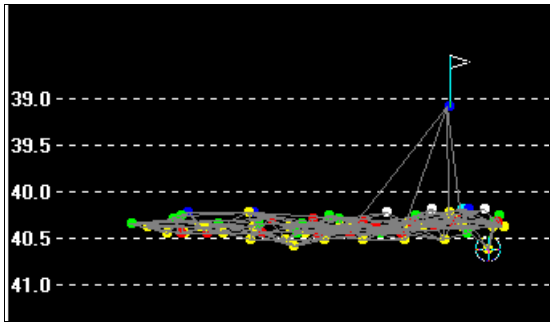
MARKING POINTS OF INTEREST

Marking points of interest in any window flags the same point in all windows. You can look at marked points again in another window or in another the next phase.

To mark points of interest:

1. **Click on the place you want to mark** in the data display.
2. **Click the flag icon**. A flag symbol will appear at that position during all editing phases.

FIGURE 6-55. Flagged Point in the Cell Window of Phase 3



PHASE ONE EDITING IN THE HYSWEEP® EDITOR

In Phase one editing, enables the some of the routines accessed from the Tools menu.

Phase one editing includes several display windows where you can view graphs of the various correction values that will be applied to your data

along with the track lines of your survey data. You can edit some of the data in a limited way.

- Sound Velocity (view only)
- Pitch, Roll and Heading (view only)
- Survey (track lines only)
- Heave
- Tide and Draft Corrections

Corrections will be applied to your raw data as you advance to Phase Two editing.

Block Editing Track Lines

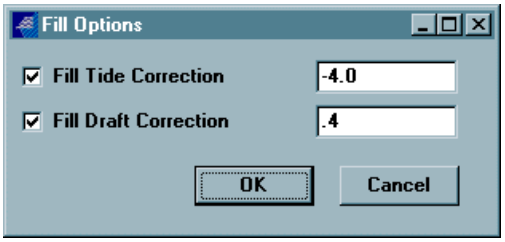
In the Survey window, you can trim position spikes with the point editing icon. Block editing, however, is a more efficient way to trim curves from the ends of the track lines.

Block Editing Tide and Draft Corrections

Block Edit tide and draft corrections using either of two methods:

- **The Standard Block Edit** deletes the correction values inside or outside the user-defined range.
  - If you delete *inside* the block, the editor will interpolate correction values across the time where you have deleted the data.
  - If you delete *outside* the block, the editor will read the first correction value from the file header and maintain that value until the time stamp in the data matches the first value in the tide graph.
- **The Fill Method** changes all of the correction values of the selected type to a user-defined constant.
  a. **Click on the [N] button.** The Fill Options dialog will appear for Tide and Draft corrections.

FIGURE 6-56. *Editing Tide and Draft Corrections with Fill Options*



  b. **Check one or both checkboxes** according to what you want to edit, and enter the new values in the corresponding input box.

  Draft/Squat Corrections: When entering draft corrections, enter a positive number when the boat is riding lower in the water. The reference point is the waterline when the transducer's depth offset is measured. The draft correction does not include the transducer depth offset. Squat and settlement can be applied by changing draft values.

  Tide Corrections:

- When entering tide corrections for **depth mode**, enter tide values as *negative numbers*.
- When entering tide corrections for **elevation mode**, enter tide values as *positive numbers*.

Units are according to those selected under Geodesy (feet or meters).

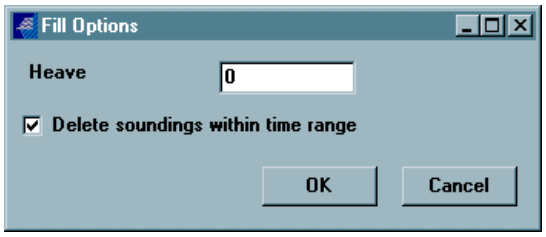
c. **Click [OK].** The graphs will be updated and the new values will be applied uniformly to your data.

Block Editing in the Heave Window

To edit the heave graph:

1. **Click and drag a box around the portion of data** you want to edit.
2. **Edit the data defined by the box.**
   - **Click the Remove Heave Drift button .**
   - **Click the [N] button** and the Fill Options dialog for heave will appear.

FIGURE 6-57. *Editing Heave with Fill Options*



- **Change the heave value for the defined time.** Enter a new value in the Heave field. This could be useful where the survey vessel had not quite settled into the regular pattern centered over the "0" line when the logging began. Since heave generally averages out to approximately "0", using this feature to edit the heave for that segment to "0" may improve your accuracy.
- **Remove sounding data logged during the defined time** by checking 'Delete soundings within time range'.

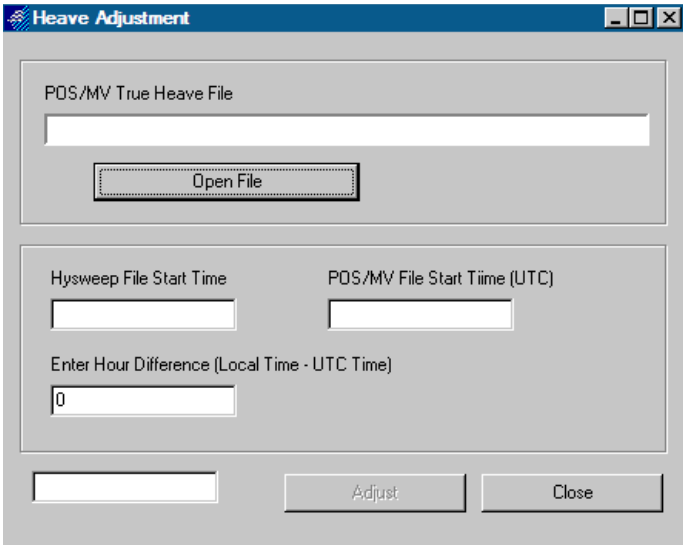
Heave correction, applied as you advance to Phase Two, is the average of heave at ping and receive time (different for each beam).

Applying True Heave in POS/MV and F180 Data

If you have logged POS/MV Group 111 data or F180 CSV data during survey, the editor programs include a specialized routine that applies that true heave data to your sounding data.

1. **Select TOOLS-HEAVE ADJUSTMENT** and the type of true heave data you have collected. The Heave Adjustment dialog will appear.

FIGURE 6-58. Heave Adjustment Dialog



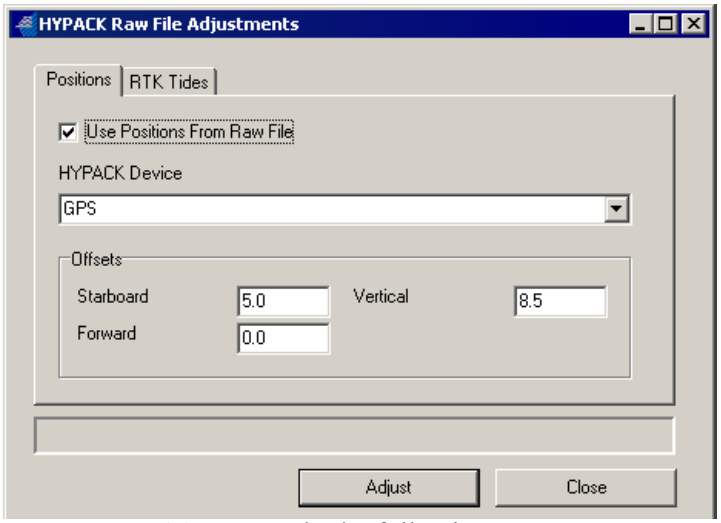
2. **Click [Open File] and select your true heave file.** The start times from both your single beam file and your true heave are displayed.
3. **Calculate the time difference** between the two start times and enter it under 'Enter Hour Difference'.
4. **Click [Adjust]** to apply the delayed heave. All soundings are now corrected with the true heave values.

RECALCULATING POSITION FROM RAW DATA

If your hardware configuration includes more than one positioning device (mobile), HYSWEEP® SURVEYautomatically reads the position from the first positioning device in the configuration. This routine enables you to recalculate the positioning based on the positions from other positioning devices in the configuration.

1. **Load your raw data** to the HYSWEEP® EDITOR.
2. **In Phase I editing, select TOOLS-HYPACK RAW FILE ADJUSTMENTS.** The Raw File Adjustments dialog will appear.

FIGURE 6-59. Raw File Adjustments Dialog - Positions Tab



3. **In the Positions tab,** do the following:
   - **Check the 'Use Positions from Raw File' option.**
   - **Enter the device and its correct offsets** from the vessel origin.
4. **Click [Adjust]**.

RECALCULATION OF POSMV SURVEY DATA FROM POSPAC RAW DATA

If you are using the Applanix POS MV with POSPac for positioning and as your motion sensor, you can improve the accuracy of your survey data.

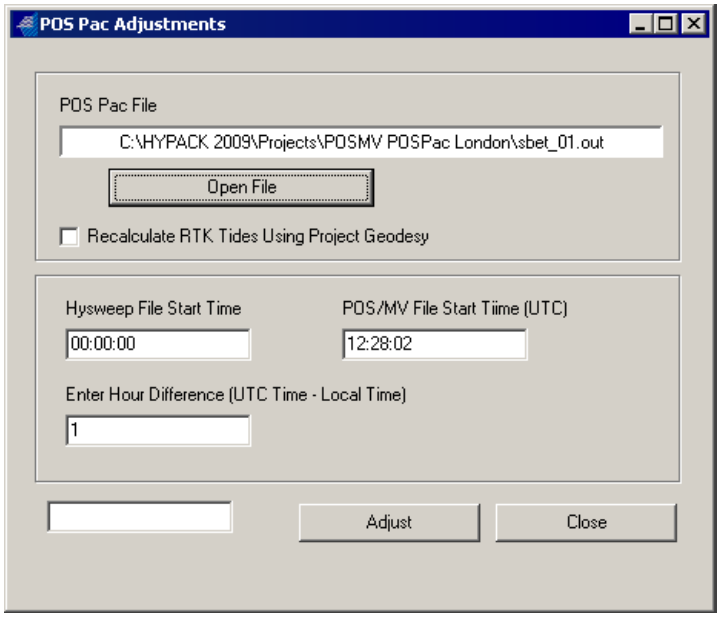
The POSPac Adjustments routine in the editor program uses the POSPac file (*.OUT or SBET file) to recalculate the following values:

- GPS Latitude, Longitude and elevation
- Pitch
- Roll
- Heading
- Tide (optional)

Since the data in the POSPac file is quite accurate and post-processing calculations can be better than those done in real-time, this routine typically improves the accuracy of your survey data.

1. **Load your raw HYSWEEP® data to the HYSWEEP® EDITOR**.
2. **In phase one editing, select TOOLS-POSPAC ADJUSTMENTS**. The POSPac Adjustments dialog will appear.

FIGURE 6-60. *POSPac Adjustments Dialog*



3. **Enter the adjustment parameters**.
   - **POS Pac file** (*.out) logged with your HYSWEEP® data.
   - **HYSWEEP® File Start Time** and **PosMV Start Time** update automatically according to the information in the files themselves.
   - **Hour Difference** is the difference between the POSPac UTC time and Local Time setting *on the Survey Computer*.
   - **Recalculate RTK Tides Using Project Geodesy**: Check this option if you want to recalculate your tide corrections with all of the other calculation adjustments.
4. **Click [Adjust].** A series of numbers will be displayed at the lower left and the cursor shows the hourglass to indicate the calculations are in progress.
5. **When the calculations are finished, click [Close]** to return to the HYSWEEP® EDITOR.

PHASE TWO EDITING IN THE HYSWEEP® EDITOR

When you have completed Phase One, advance to Phase Two by selecting FILE-CONVERT RAW TO CORRECTED. The Phase One displays will be closed and the Sweep and Survey Information windows will appear. Editing can only be done in the Sweep window.

The Search and Filter options are used in Phases Two and Three of editing your multibeam data. The HYSWEEP® EDITOR can then search for matrix cells with data outside of these user-defined limits.

Manual Editing:

1. **Set your Search and Filter criteria**.
2. **Select EDIT-FIND NEXT** (F3 or the Search icon). The HYSWEEP® EDITOR will systematically scan the matrix for cells with data outside of the Search and Filter limits. The data in that cell will be displayed in the Survey, Profile and Cell windows.

3. **Examine and edit your data**. These windows provide many ways to view data. It is your decision what data to edit.
4. **Continue to repeat the search and edit process** until the HYSWEEP® EDITOR has progressed to the end of your data.

Automatic Editing:

1. **Set your Search and Filter criteria**.
2. **Do one of the following:**
   - **Select EDIT-FILTER LINE** (Shift+F6) deletes all points in the line currently displayed that fall outside the filter limits.

   - **Select EDIT-FILTER ALL** (F6) deletes all points in the entire data set that fall outside the filter limits.

Beware!

BEWARE! It's fast! It's easy! *It's DANGEROUS!!!* No computer program can replace human intelligence and common sense when it comes to editing data. *Use this feature with caution!*

NOTE: The Filter All icon is in the HYSWEEP® EDITOR shell. The Filter Window icon looks the same, but it appears in one of the windows.

POINT EDITING IN PHASE TWO

In addition to point editing with the Delete Point icon, the eraser tool can be used to delete one or more, closely positioned soundings.

1. **Click the eraser icon** on the Survey window. The cursor becomes a small square.

2. **Center the cursor over the point (or points) you want to delete and click**.

BLOCK EDITING IN PHASE TWO

In addition to the standard block editing technique, phase two

To remove an entire sweep:

1. Place your cursor on the sweep you wish to delete.
2. Click Ctrl + Delete point icon.

Filter Window: The Filter Window button appears in the Sweep window in phase two, as well as the Cell and Profile windows in

phase three. It removes all soundings displayed in the window that are outside of the Search and Filter criteria.

Correcting your Sound Velocity Profile with the Sound Speed Adjustment Tool

In multibeam surveys, if sound velocity information is inaccurate, the survey results range from slightly inaccurate to completely worthless.

When everything works correctly:

- A sensor at the sonar head accurately measures sound speed in real time.
- A cast is done periodically to find sound speed in the water column; the profile.
- Casting is done frequently enough so that changes that naturally occur are accurately reflected in the profiles.

Failure in any of these factors--equipment failure or casts taken too infrequently-- results in multibeam errors. When you have completed the preliminary cleaning of your depth data in phase 2 of the HYSWEEP® EDITOR, if the profile view of the depth swaths turn up or down on each end, it is an indication that your sound velocity correction information is inaccurate.

We cannot correct problems that occur at the sonar head, but if you feel the sound speed values recorded during survey are inaccurate, you can choose to omit them by clearing the 'Adjust SV Profile Each Ping Using SV at the Sonar Head' option in the Advanced tab of the Read Parameters dialog when you first load your data into the HYSWEEP® EDITOR

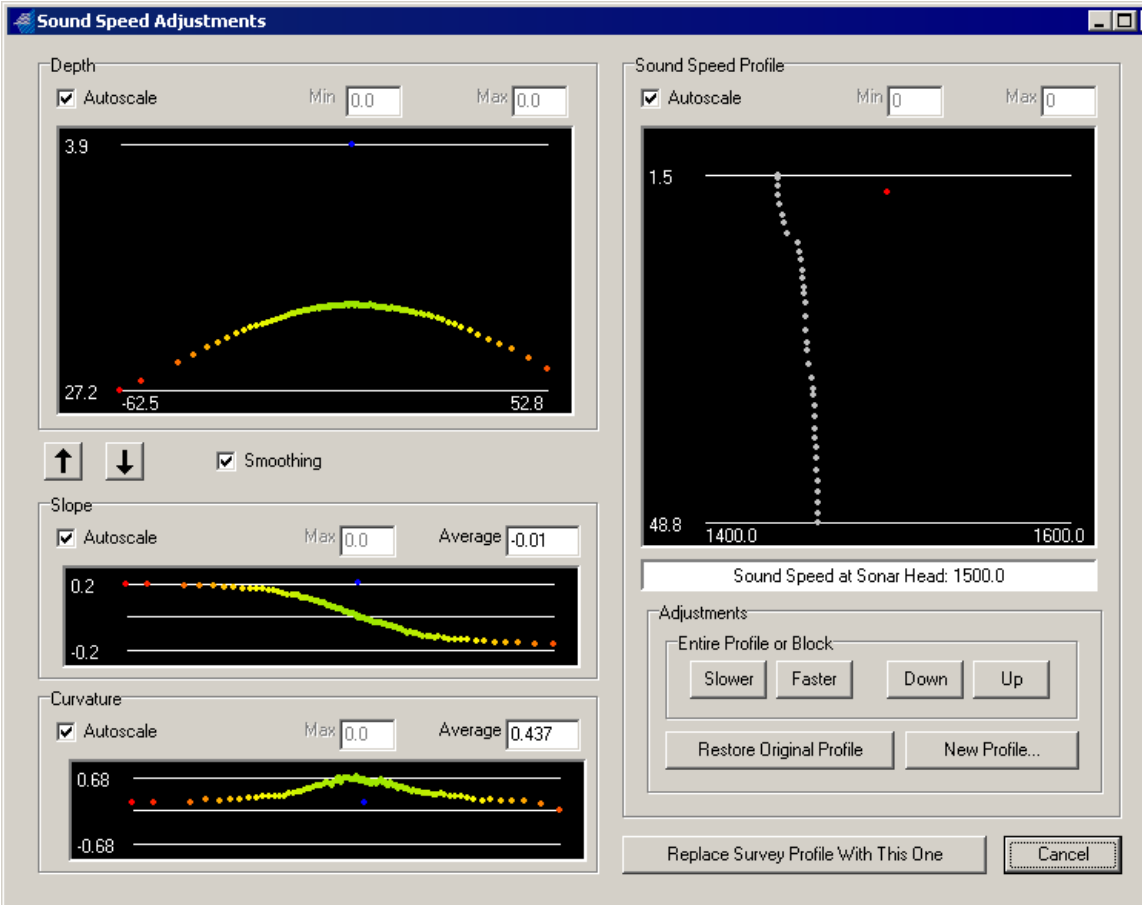
The Sound Speed Adjustments routine in the HYSWEEP® EDITOR can help compensate for common sound velocity errors.

NOTE: Use this tool after *phase* 2 data cleaning is complete.

Sound Speed Adjustments Interface

To launch the Sound Speed Adjustments tool, select TOOLS-SOUND SPEED ADJUSTMENTS.

FIGURE 6-61. *Sample Data in theSound Speed Adjustments Tool--Before Adjustments*



- **Depth** shows all valid depths in the current sweep without tide corrections. You may enter minimum and maximum depth scaling or allow the program to auto scale based on the range of depths. In the sample, a flat bottom area shows as a 'U' shape or smiley face, which is indicative of sound speed errors. The adjustment goal is to flatten out the depth points.
- **Slope**: Graph shows the slope (vertical change/horizontal change, or 1st depth derivative) between each pair of consecutive points across the sweep. Average is simply the average slope of all points.
- **Curvature**: Graph shows curvature (vertical change/horizontal change *in the slope graph* or 2nd depth derivative) at all pairs of consecutive points across the sweep. Average is the average curvature taken over all points.
- **Sound Speed Profile**: Shows the water column sound speed to the end of the cast.
- **Sound Speed at Sonar Head:** For reference only.
- **Adjustments**: Profile points may be shifted left / right (slower or faster) or up / down. You can use your mouse to draw a rectangle in

the sound speed profile graph, in which case only points inside the rectangle are shifted.

- **Restore Original Profile:** Useful for trial and error.
- **New Profile:** Replaces the original profile with one based on user parameters:

SHIFTING YOUR SOUND VELOCITY PROFILE

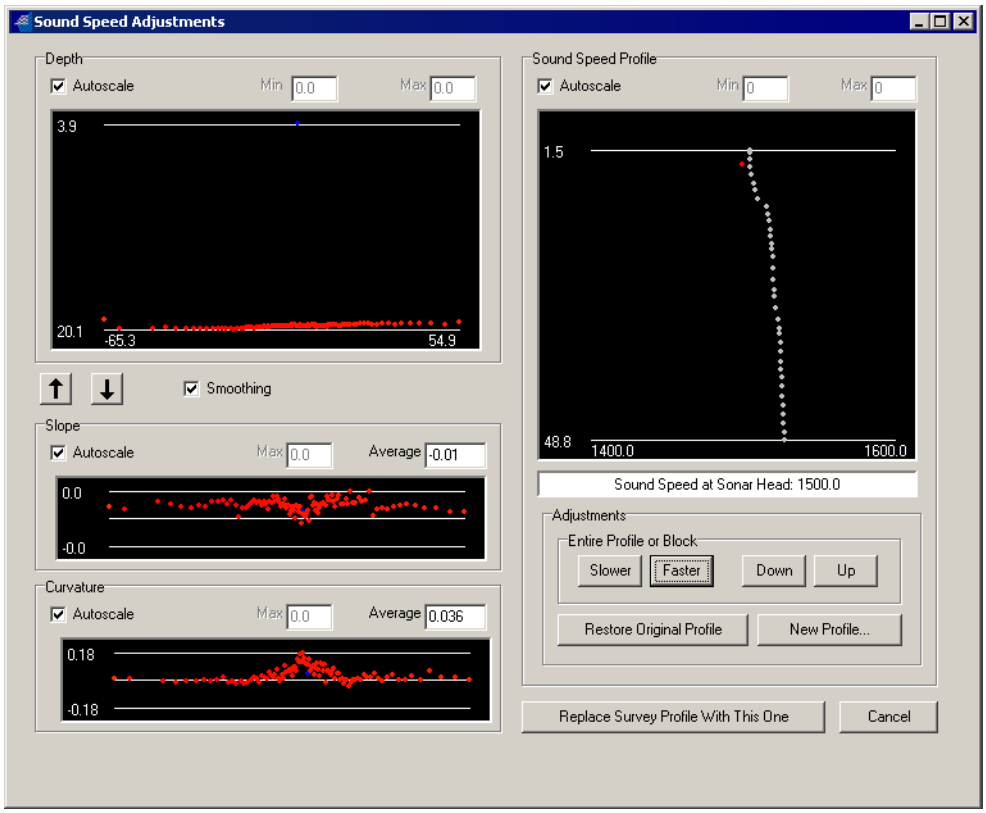
If you have sound velocity data, but find your casts should have been more frequent to more accurately reflect the survey conditions, you may be able to adjust your profile for select lines--those that curl on the ends when they should be flat.

1. **Use the up and down arrows to scroll through the depth profiles** until you reach a line where the data curls.
2. **If you want to shift only part of the sound speed profile, use your cursor to drag a box around that portion of the profile**. Otherwise, the whole profile will shift.
3. **Use the 'Adjustments' buttons to shift the profile** left ([Slower]), right ([Faster]), Up or down, or any combination. Until the average slope and curvature values are at or near zero and the depth swath flattens.

TIP If you are unsatisfied with your results, start over by clicking [Restore Original Profile].

4. **When you are satisfied with your results, click [Replace Survey Profile With This One].** You will be asked to choose to apply the revised profile to the entire data set or to only the sweep currently displayed.

FIGURE 6-62. Sample Data in theSound Speed Adjustments Tool--Before Adjustments



GENERATING A NEW SOUND VELOCITY PROFILE

If you, for some reason, have a data set with no sound velocity data, you can use the Sound Speed Adjustment tool to create an approximate sound velocity profile based on data gathered over a flat bottom. In this case, all swaths should curl on the ends.

1. **Click [New Profile]**.
2. **Set the new profile options**.
   - **Minimum Depth:** Surface sound speed is taken from the sensor and typically extends down about 6 ft (2 m).
   - **Maximum Depth** of the survey area.
   - **Gradient:** This is trial and error to determine the best value for your conditions. Begin with a value of -0.7.
   - **Number of Points in the profile.** Start with 10.

TIP If you are unsatisfied with your results, start over by clicking [Restore Original Profile].

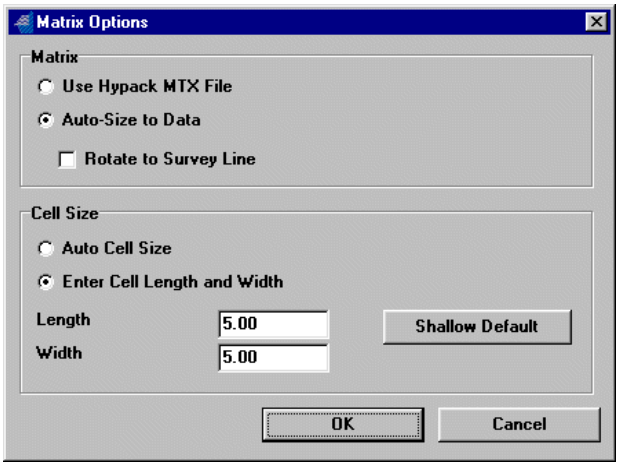
3. **When you are satisfied with your results, click [Replace Survey Profile With This One].** You will be asked to choose to apply the revised profile to the entire data set or to only the sweep currently displayed.

- **To apply the new profile to all swaths**, click [Yes].
- **To apply the new profile only to the current swath**, click [No].
- **To return to the Sound Speed Adjustment tool**, click [Cancel].

MATRIX SETTINGS IN THE HYSWEEP® EDITOR

Phase three of editing multibeam data requires that your data be gridded in a Matrix File. Select FILE-FILL MATRIX and the Matrix Options dialog will appear

FIGURE 6-63. *Matrix Options Dialog in the HYSWEEP® EDITOR*



If a Matrix File already exists in the project, you may opt to "Use HYPACK® Matrix File". In this case, you may either use the cell dimensions already defined ("Use Length and Width from Matrix File") or you may define new dimensions by selecting "Enter Cell Length and Width" and typing in the new dimensions.

If no Matrix File exists in your project, select Auto-Size to Data and the HYSWEEP® EDITOR will create a Matrix File to fit your selected data. You can set the cell dimensions or let the HYSWEEP® EDITOR set the size. Auto Cell Size automatically calculates cell size to average 25-50 points per cell.

NOTE: If the user-defined cell dimensions result in cells containing more than 2000 points, the program will abort loading the soundings to the matrix and ask you to input new cell dimensions. Do this by reselecting FILE-FILL MATRIX.

[Shallow Default] will set your cell length and width to five feet or two meters, according to your survey units. You may set other measurements if you wish.

PHASE THREE EDITING IN THE HYSWEEP® EDITOR

In Phase Three, use the Search and Filter options to re-evaluate any points you may have left in during Phase Two. This phase grids the soundings to a matrix and displays the data in ways that were not previously available to you and that may make your editing decisions more clear.

Phase Three also uses the Statistical Filters which may present you with some new points to evaluate.

Three windows that display your data.

- The **Survey window** shows the full 3-dimensional display of your data with the cursor position at the crosshairs. You may also drag the cursor to measure the distance and azimuth between two points.
- The **Profile window** shows the cross section of data at the cursor position and oriented according to the setting in the View Options dialog.
- The **Cell window** shows only the soundings contained in the matrix grid or, with a click of the 'Include Neighboring Cells' button, it may include soundings from the surrounding cells to provide additional context for your editing decisions. The information in the status windows at the left pertains to the current position. .

Scroll through your data using the arrow keys in the Cell or Profile window. Arrow keys in the Profile window, scroll by the number of rows or columns specified in the Profile View Options. The arrow keys in the Cell window shift the display one cell. You can also jump to the first or last cell in the column or row using the 'Go to Beginning' and 'Go to End' arrow keys in the Profile window.

Protecting Cell Data from Filtering:

You can protect the data in a cell from being affected by any filter operations. With the cell displayed in the Cell Window, just click the lock icon. This can be useful if your survey area contains objects, such as pilons, that jut up from the bottom. Just 'lock' those areas, then you are safe to filter your data using settings that would otherwise remove those objects.

To unlock all protected cells, select EDIT-UNLOCK ALL CELLS.

Using the Border Tool:

In addition to the standard point and block editing tools, you can use rhe Border Tool in the Profile window to create an irregular area on which to perform a block edit.

1. **Click the Border Tool icon.**
2. **Define the perimeter of the area to be removed** by clicking series of points in the Profile window display.
3. **Click the Delete Inside Block (I) or Delete Outside Block (O) icon,** the HYSWEEP® EDITOR closes the border and performs the edit.

FIGURE 6-64. *Before the Edit.*

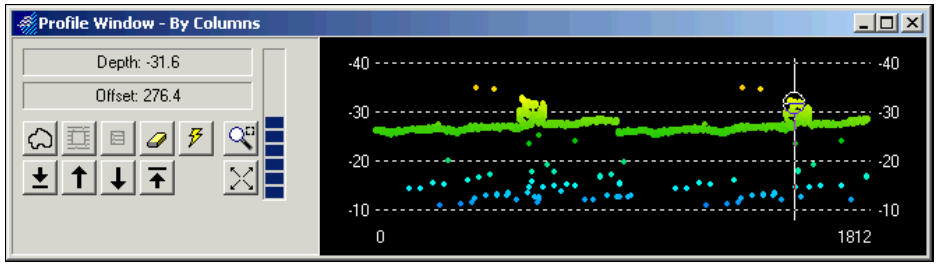
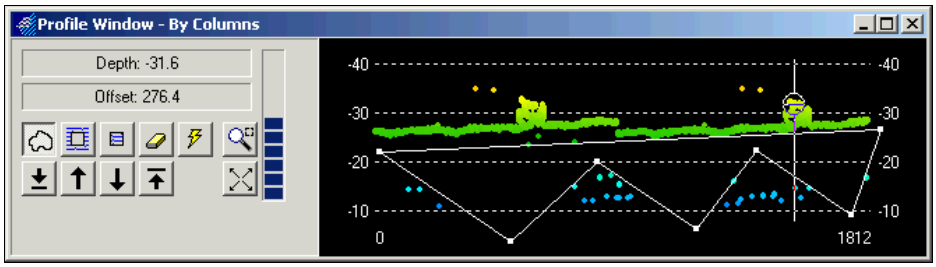


FIGURE 6-65. *After the Edit*



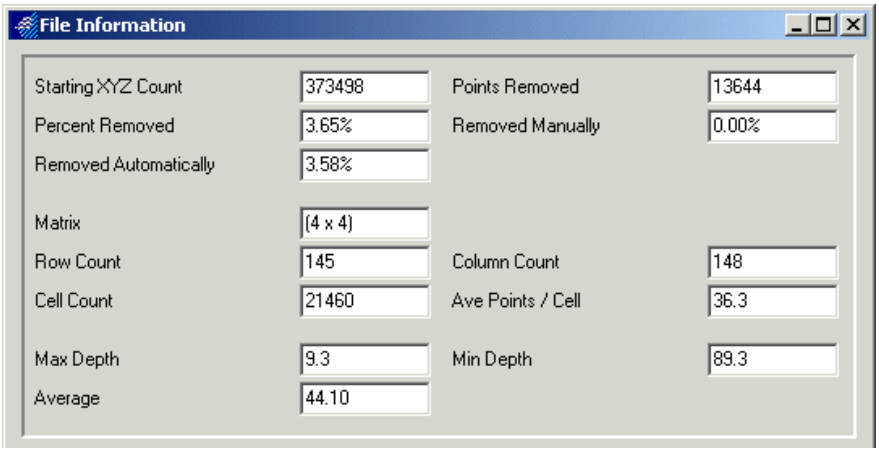
Filter Window: The Filter Window button appears in the Sweep window in phase two, as well as the Cell and Profile windows in phase three. It removes all soundings displayed in the window that are outside of the Search and Filter criteria.

FILE INFORMATION IN THE HYSWEEP® EDITOR

The File Information presents a series of statistics about the XYZ file currently loaded to the HYSWEEP® EDITOR. It is only available during phase three editing in the File Information dialog and in the Patch Test interface.

To display the File Information dialog, click the icon in the HYSWEEP® EDITOR shell.

FIGURE 6-66. *File Information Display*



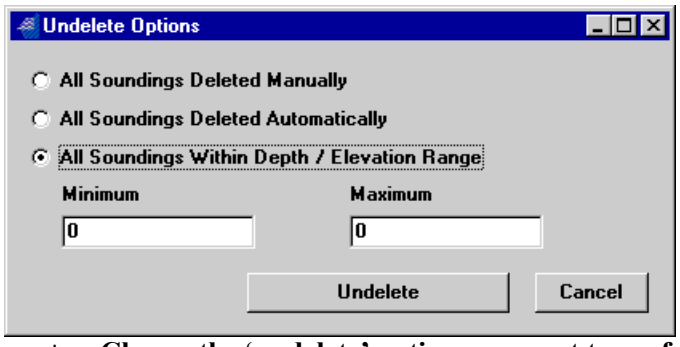
RESTORING DELETED SOUNDINGS

If you edit or filter your data then discover you've done it wrong, don't panic! You have some options during Phase Two and Three editing.

- **The Undo icon** in the HYSWEEP® EDITOR shell is used to reverse the previous operations, one at a time.

- **To restore a deleted point,** set the view option *Show Deleted Points*, put your cursor on the point you want to restore and select EDIT-UNDELETE POINT (or Shift+Del).
- **The Undelete dialog** restores deleted soundings according to specified criteria.
  a. **Select EDIT-UNDELETE…** and the Undelete Options dialog will appear.

FIGURE 6-67. *Undelete Options Dialog*



  b. **Choose the 'undelete' option you want to perform**. You can restore all soundings removed manually, removed automatically or that fall within a user-defined depth range.
  c. **Click [Undelete]** and the points will be restored accordingly.

SAVING EDITED MULTIBEAM SURVEY FILES

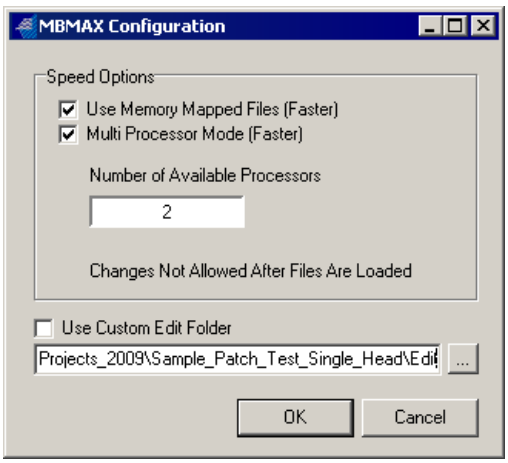
FILE-SAVE displays the File Save dialog where you can choose the file format for the save data and, in some cases, some additional save options.

In most cases the edited data is saved, by default, to the project's Edit folder. Reduced XYZ format data will be saved to the Sort folder.

To choose an alternate location for your data:

1. **Select TOOLS-MBMAX CONFIGURATION**. The configuration dialog will appear.

FIGURE 6-68. *Configuration Dialog*



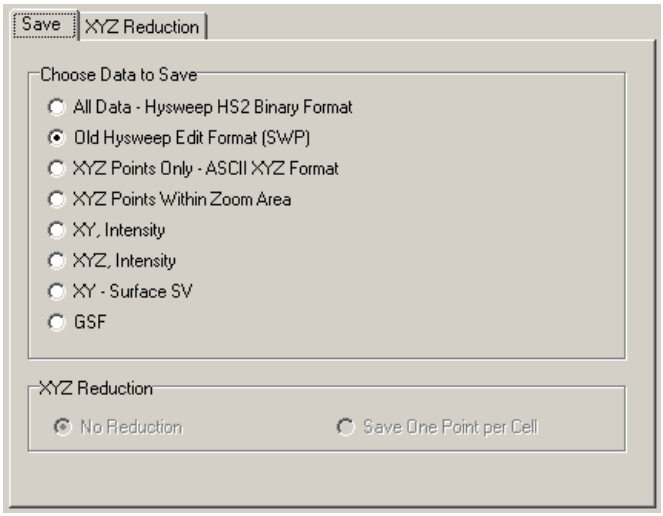
2. **Check 'Use Custom Edit Folder'**.
3. **Click [...], browse for your alternate location and click [OK]**.

NOTE: When a Custom Edit Folder is selected, HS2, GSF, XYZ and SWP files are all saved to that location.

FILE SAVE OPTIONS IN THE HYSWEEP® EDITOR

When you select FILE-SAVE or click the File Save icon, the File Save Options dialog appears. This is where you specify the format to which you want to save your data.

FIGURE 6-69. *File Save Options-Save Tab*



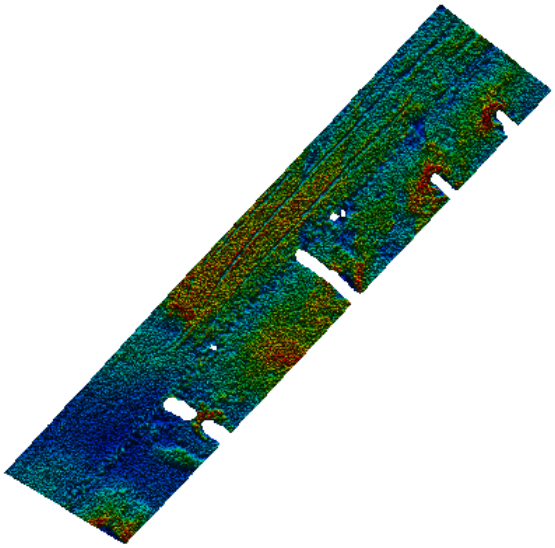
The HYSWEEP® EDITOR can save to any of the following formats:

- **HS2 format :** A binary file format, saved using the same name as the open file.

  TIP: We recommend that you save your data first to the HS2 format to preserve all edited data. The HS2 format retains all data should it be needed for further editing or correction of offsets, mounting angles, sound velocity, etc. Once this is saved, you can save it again to your choice of other output formats.

- **XYZ format** . If you save to XYZ format, you may choose to save all of your edited data or only what is visible in the Survey Window. You may also choose to perform a data reduction in the same manner as the MAPPER program.
- **XY, Intensity** and **XYZ, Intensity:** Intensity is simply the receive amplitude of the beam. Higher amplitudes are returned by rock faces, sand and gravel; lower amplitudes from mud and silt. This being the case, rudimentary seafloor classification can be made by mapping intensity values.

FIGURE 6-70. Sample Intensity Model—High intensity returns are red and low intensity are blue.



- **XY, Surface SV:** This enables you to display areas where your sound velocity corrections differ significantly.
- **GSF format:** Generic Sensor Format is a standard format for bathymetry data, particularly useful for data sets created by systems such as multibeam echosounders that collect a large quantity of data. GSF files are read into the GEOCODER™ program where they can be mosaicked.
- **SWP format:** an old HYPACK® edited multibeam format. It is an ASCII format.

XYZ Reduction: In phase 3 editing, if you choose the 'XYZ Points Only' option, you can save all of the data or save only one point per matrix cell in the Survey window.

To reduce your data, select 'One Point per Cell' and set the value in the XYZ Reduction tab.

TIP: You can load any of the XY_ data to the TIN MODEL program for some dramatic visualizations then, better still, you can export that model to a geo-referenced TIF and display it as a background chart.

FILE-SAVE TO MATRIX asks you to name your file and saves the filled matrix to the project directory.

SOUNDING REDUCTION ON XYZ FILES IN THE HYSWEEP® EDITOR

A sounding reduction, which provides the same results as the MAPPER program, may be done during the save process.

Select FILE-SAVE and the File Options dialog will appear.

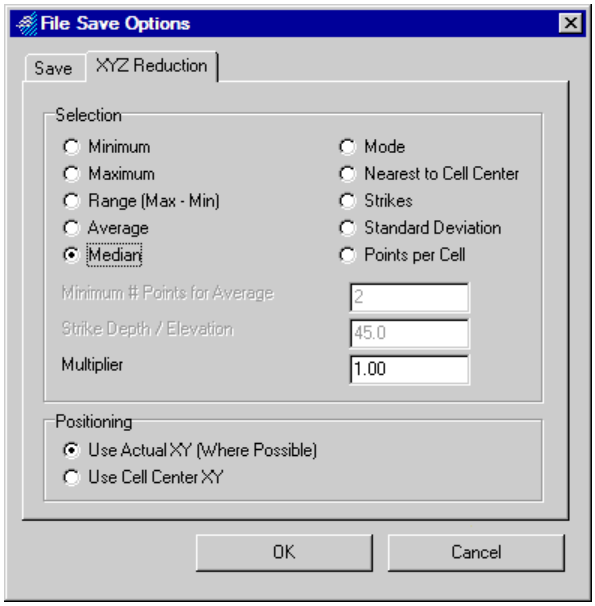
- **In the Save Tab**, select the 'XYZ Points Only' and the 'One Point per Cell' options.
- **In the XYZ Reduction Tab**, choose the value you want saved to each cell, as well as the position of the sounding within the cell.

We recommend using the actual position of the sounding for accuracy's sake.

This tab is only available in the third phase of editing.

- **If you choose to save XYZ data in the Save Tab**, the options in the XYZ Reduction Tab specify the reduction criteria. It enables you to determine what information is saved (Minimum, Maximum, Average, Nearest to Cell Center, or Maximum minus Minimum, etc.) and if it is saved in its actual position or at the center of the cell.
- **If you choose the Average option**, set the minimum number of points a cell will need to calculate average value. Any cells with fewer than the defined number of cells will be left empty.

FIGURE 6-71. *File Options-XYZ Reduction Tab*



Most of the Selection options are self-explanatory.

Strikes enables you to save and display only soundings that are above or below a user-specified level (the Strike Depth/Elevation). It does not save the sounding, but saves the difference between the sounding and the specified level.

Multiplier multiplies the depth or standard deviation value and saves the result as the Z value.

Positioning enables you to save the data in its actual position (where possible) or in the center of the cell.

When you save the data in the center of the cell, it moves the data, not always the best thing to do.

QUALITY CONTROL TESTS IN THE HYSWEEP® EDITOR

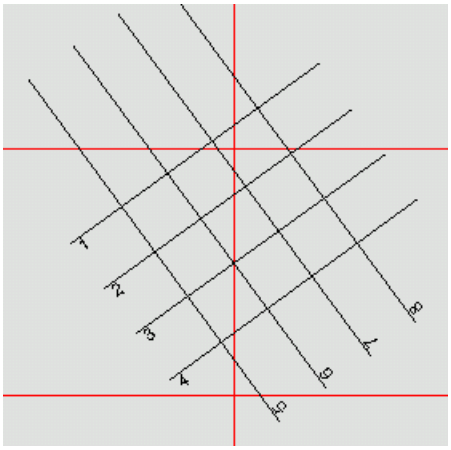
Two QC tests are available in the HYSWEEP® EDITOR. The Beam Angle Test estimates multibeam depth accuracy at various angle limits using a Reference Surface. The Single Beam Test compares multibeam to single beam data.

CREATING YOUR REFERENCE SURFACE

The Reference Surface is created by a small test survey over a relatively flat bottom—the center of a dredged channel provides good results. (A flat bottom is chosen to minimize the contamination of the depth accuracy test by position error. Position specs are much looser than depth specs.) Run the survey at low or high tide to decrease potential for errors due to changing tide or water conditions.

1. **Use the LINE EDITOR to create your survey lines.** (No template information is needed for this process.) Eight survey lines are run--one set of four parallel lines separated by water depth and another set of four run perpendicular to the first set, providing 400% coverage.

FIGURE 6-72. *Perpendicular Reference Survey Lines*



2. **Use the MATRIX EDITOR to create a Matrix File** to border the reference area (reference.mtx). Align the matrix edges with the survey lines and specify the cell dimensions to by 1'x1'.
3. **Take a sound velocity cast** within the reference area.
4. **Take an initial tide measurement**.
5. **Run the reference survey and your check lines** (multibeam, single beam or both) in rapid succession.
6. **Take your final tide measurement**.
7. **Create a Tide Corrections File** using the MANUAL TIDES program and your tide measurements.
8. **Create a Sound Velocity Corrections File** using the SOUND VELOCITY program.

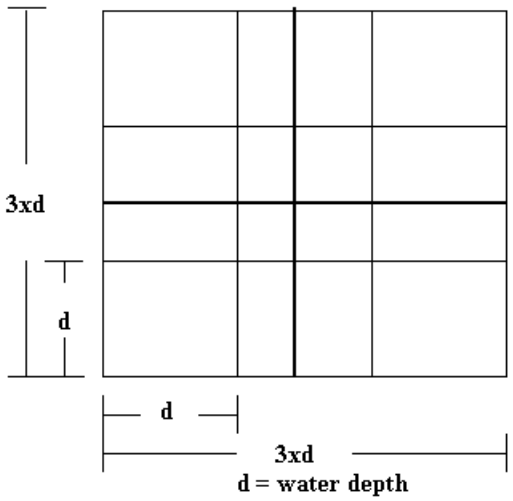
9. **Use the** HYSWEEP® EDITOR **to apply your Tide and Sound Velocity corrections and to remove spikes and outliers.** Limit your beam angle to 45 degrees.
10. **Save the gridded average to XYZ format** (reference.xyz).
    a. **Select FILE-OPTIONS**.
    b. **In the Save Tab**, select XYZ points only and Save One Point Per Cell.
    c. **In the XYZ Reduction Tab**, select Average and Use actual Position Where Possible.
    d. **Select FILE SAVE**. The processed reference survey becomes the reference surface.

BEAM ANGLE TEST

The Beam Angle Test compares multibeam check lines to a reference surface and estimates the depth accuracy of the multibeam system at different angle limits. The estimated accuracy can be used to determine if the multibeam system meets survey specifications.

1. **Run the reference survey**.
2. **Run one or two multibeam check lines through the center of the reference area** immediately after running the reference survey.

FIGURE 6-73. *Check Lines*



3. **Process the check lines in the** HYSWEEP® EDITOR to apply corrections and clean the data. No angle limits are applied—all beams are retained for statistical testing. Use your reference matrix file (reference.mtx) in the Phase Three editing.
4. **Run the Beam Angle Test**.
    a. **Select TOOLS-BEAM ANGLE TEST**.

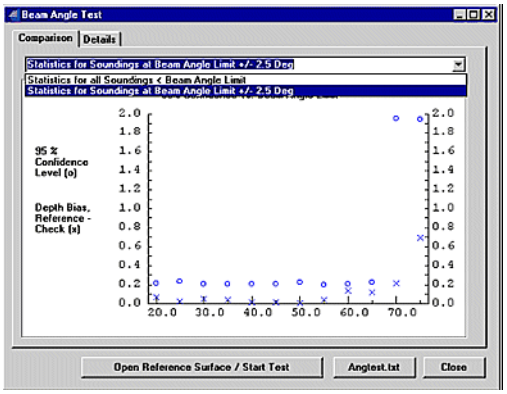
- **If you want to use all beams less than the angle limit**, change the selection at the top of the Comparison tab. A file selection dialog will open.
- **If you want to use only beams within 2.5 degrees of the angle limit,** click [Open Reference Surface/Start Test]. A file selection dialog will open.

b. **Select the Reference Surface to which you will compare the check lines and click [OK].** The calculations will be made and the results will be graphed to the screen.

The Beam Angle Test presents two graphs.

- The **Comparison graph** shows the correlation between depth accuracy and beam angle. This comparison may be based on all soundings from beams less than the angle limit or soundings from beams within 2.5 degrees of the angle limit. Typically, we see a decrease in accuracy when the beam angle exceeds 75 degrees.

FIGURE 6-74. *Beam Angle Comparison Graph*

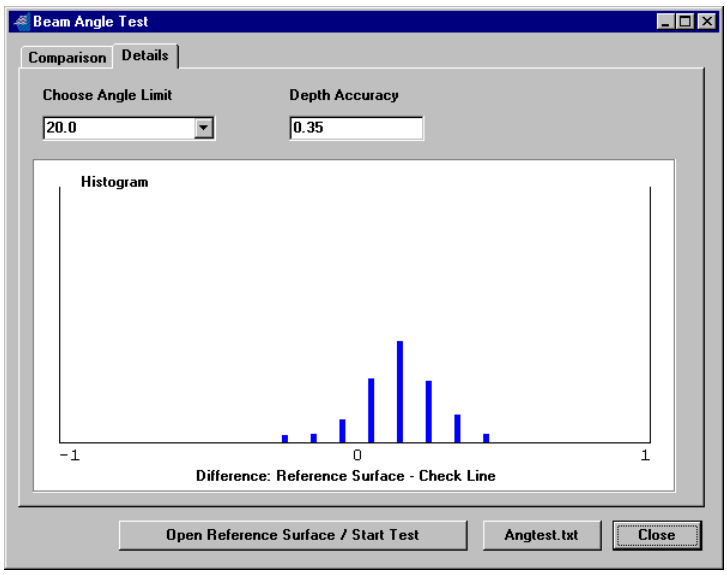


- The Beam Angle Test also calculates the differences in depth readings between the reference surface and the check lines. It then graphs the number of differences, in increments of 0.1 survey units, in the **Details Tab**. Perfect accuracy would be reflected in a single vertical line centered over the zero. Since surveying technology is not perfect, you should see the data presented in a bell curve. The Depth Accuracy is the average difference calculated using data from the beams within a user-specified angle limit.

You can choose the angle limit to be used in these calculations. The graph and depth accuracy will update according to the selected depth angle.

NOTE: The program will omit any beam angles where the data falls outside of the reference matrix.

FIGURE 6-75. *Beam Angle Details*



You can view the information in more detail by clicking [Angtest.txt]. The program will show the same information in a more detailed form.

FIGURE 6-76. *A Sample Angtest*

Angtest.txt - Notepad

File Edit Search Help

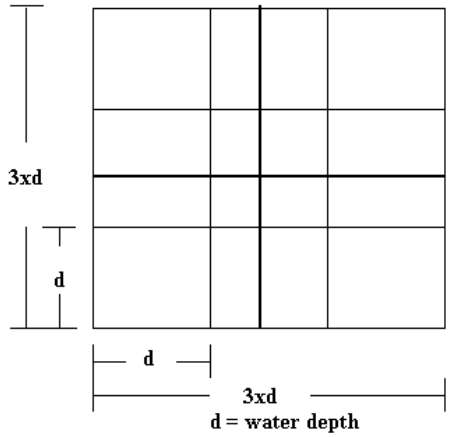
```
+/- Beam Angle Limit     Depth Accuracy at 95% Confidence
        20                      0.35    ****
        25                      0.34    ****
        30                      0.33    ****
        35                      0.32    ****
        40                      0.31    ****
        45                      0.30    ****
        50                      0.29    ***
        55                      0.29    ***
        60                      0.29    ***
        65                      0.28    ***
        70                      0.29    ***
        75                      0.29    ***

Beam    Angle    Samples    Ave Diff (Ref-Check)
   1        0          0         0.00
   2        0          0         0.00
   3        0          0         0.00
   4        0          0         0.00
   5        0          0         0.00
   6       66         13         0.24    ***
   7       66         25         0.18    **
   8       65         25         0.16    **
   9       64         25         0.10    **
  10       63         25         0.07    *
  11       61         25         0.08    *
  12       59         25         0.08    *
  13       57         25         0.08    *
  14       56         25         0.08    *
```

SINGLE BEAM TEST

The Single Beam Test provides a statistical comparison of multibeam to single beam data.

1. **Run the reference survey**.
2. **Run one or two single beam check lines** through the center of the reference area immediately after running the reference survey.

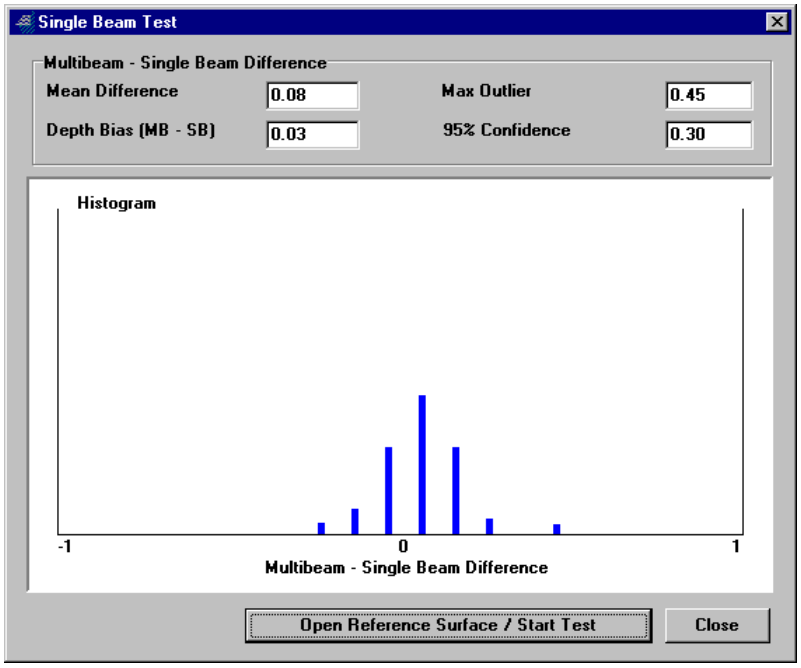
FIGURE 6-77. *Check Lines*



3. **Edit the single beam check lines** in the SINGLE BEAM EDITOR.
4. **Reformat the check lines to XYZ format** using EXPORT.
5. **Load the single beam check lines** to the HYSWEEP® EDITOR. No cleaning is required as this file has already been cleaned.
6. **Run the Single Beam Test**.
   a. Select TOOLS-SINGLE BEAM TEST.
   b. Click [Open Reference Surface/Start Test].
   c. Choose your reference surface to which you will compare the check lines from the file selection dialog.
   d. Click [OK] and the calculations will be made and the results displayed.

The Single Beam Test calculates the differences in depth readings between the reference surface and the check lines. It then graphs the number of differences, in increments of 0.1 survey units. Perfect accuracy would be reflected in a single vertical line centered over the zero. Since surveying technology is not perfect, you should see the data presented in a bell curve.

FIGURE 6-78. Single Beam Test

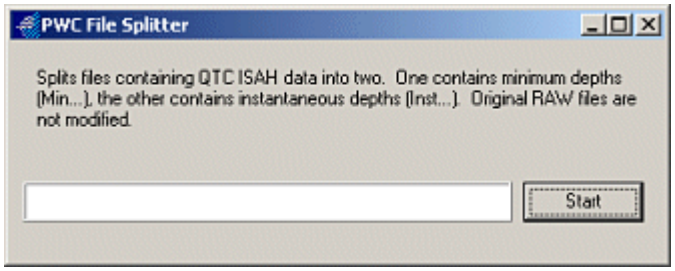


PWC FILE SPLITTER

The PWC File Splitter splits the data in raw or edited files containing QTC-ISAH data. It creates two new file sets and stores them to the same folder as the original data. One data set contains minimum depths and the other contains instantaneous depths. The original files remain intact.

1. **Select TOOLS-PWC FILE SPLITTER** and the PWC File Splitter dialog will appear.

FIGURE 6-79. PWC File Splitter Dialog



2. **Click [Start].** A file select dialog will appear for you to select the log file that contains the data you want to split.
3. **Select a Log file from the raw or edit folder and click [OK].** The dialog indicates the progress of the process by displaying the name of each file in the catalog as it is affected and "Done" when the work is complete.

The PWC File Splitter loads the two new Log files with the original one to your project so they can be enabled and viewed in the HYPACK® window.

HYSWEEP® CUBE

CUBE stands for Combined Uncertainty and Bathymetry Estimator. The output of CUBE is a set of four grid surfaces; depth, depth uncertainty, hypothesis strength and number of hypotheses. Note that CUBE *does not provide actual soundings* as output, rather sounding estimates. While the estimates are likely as good as the actual soundings from which they are derived, and have the advantage of removing random noise from the data, there is resistance to this approach. For that reason, we provide a method of saving the soundings closest to the CUBE depth surface.

There are three sections to our CUBE implementation.

- The **error model** takes into account and quantifies errors associated with multibeam survey. Some model parameters are built into the program; others may be entered as appropriate for the equipment used.
- **Insertion of soundings into the CUBE model**, which happens automatically at the time survey files are loaded.
- **Extraction of the CUBE surfaces for graphical display**, scanning, review and edit.

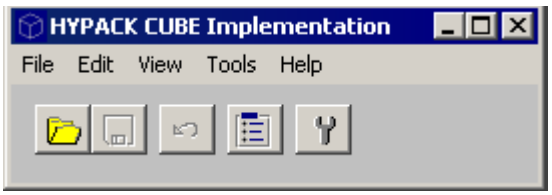
HYSWEEP® CUBE reads HYPACK® *.HS2 files or catalogs. We load HYSWEEP® EDITOR edited files instead of raw *.HSX files. This insures you have reviewed track lines, heave and sound velocity compensation and corrected for water level. None of that is done in HYSWEEP® CUBE.

In the HYSWEEP® EDITOR you can quit after edit phase one, as CUBE data cleaning is quite good. However we suggest that you use the HYSWEEP® EDITOR to remove, at least, the outliers and the outer beams of your swath where the data tends to degrade significantly.

RUNNING HYSWEEP® CUBE

1. **Pre-edit your data using the HYSWEEP® EDITOR.**
2. **Launch HYSWEEP® CUBE** by selecting HYSWEEP®-HYSWEEP® CUBE.

FIGURE 6-1. *HYSWEEP® CUBE Shell*



3. **Configure CUBE Parameters.** The first time you load your data, the Read Parameters dialog is automatically displayed. After that, to

modify your settings, you may access the dialog by selecting FILE-READ PARAMETERS in the HYSWEEP® CUBE shell..

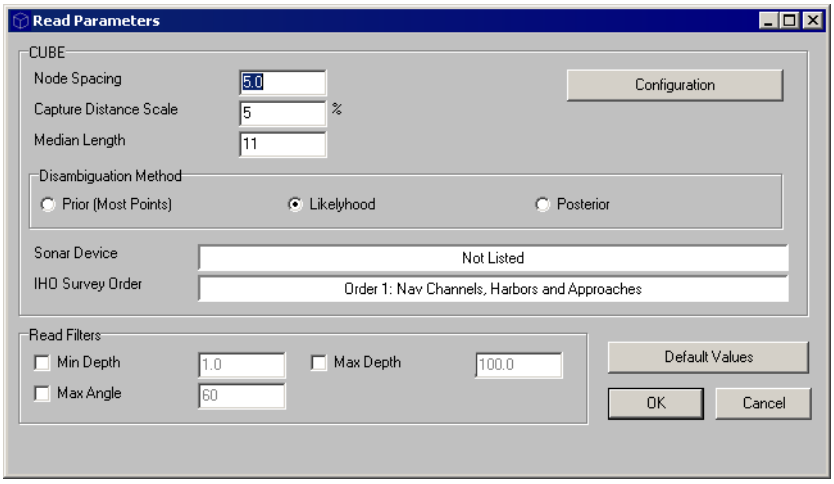
4. **Load your pre-edited data files.** Select FILE-OPEN and choose your data. HYSWEEP® CUBE reads HS2 data. You can load a single file or a catalog of HS2 files.
5. **View and clean your data** based on the CUBE Parameters.
6. **Save your data**. HYSWEEP® CUBE saves XYZ data where the Z value can represent the HYSWEEP® CUBE estimated depth, the nearest true sounding depth or one of the quality statistics for each cell.

HYSWEEP® CUBE READ PARAMETERS

The Read Parameters dialog is automatically displayed each time you load data to HYSWEEP® CUBE. You may also access the dialog by selecting FILE-SHOW READ PARAMETERS in the HYSWEEP® CUBE shell.

NOTE If you modify your read parameters after you have loaded your data files, the data must be reloaded to be affected by the new read parameters.

FIGURE 6-2. *HYSWEEP® CUBE Read Parameters*



Node Spacing: Recall that CUBE works on a grid; this is where you enter the spacing between grid nodes.

Capture Distance Scale: A sounding may influence more than one CUBE node. The influence radius of each sounding is depth times Capture Distance Scale. The default value of 5% should work in almost all cases.

Median Length: CUBE requires a minimum number of soundings to estimate node depths. That number is specified by Median Length. Median Length also controls CUBE median filter; a small number of soundings (3) is a weak filter. A large number (11) is a stronger filter.

Disambiguation Method: When CUBE detects multiple depth hypotheses, it automatically selects one using a Disambiguation Method. The options are:

- **Prior** (most points): selects the hypothesis containing the most number of soundings.
- **Likelihood:** Searches neighboring nodes for the closest with a single depth hypothesis and selects based on that.
- **Posterior**: A combination of the prior and likelihood methods.

Read Filters:

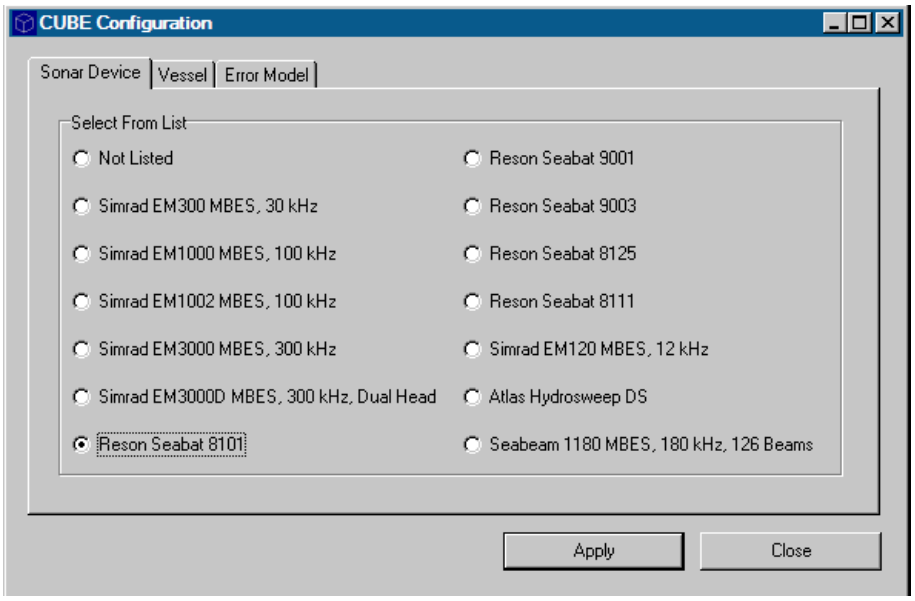
- **Minimum and Maximum Depths** describe the depth range that will be included in your data set. Soundings outside this range *in any of the hypotheses* are omitted.
- **Maximum Angle** sets the data swath width that will be included.

To configure the CUBE operational parameters, click [Configuration].

Selecting your Sonar

In the **Sonar Tab**, select your sounder. If your device does not appear in the list, select "Not Listed".

FIGURE 6-3. *Configuration Dialogs—Sonar Device Tab*



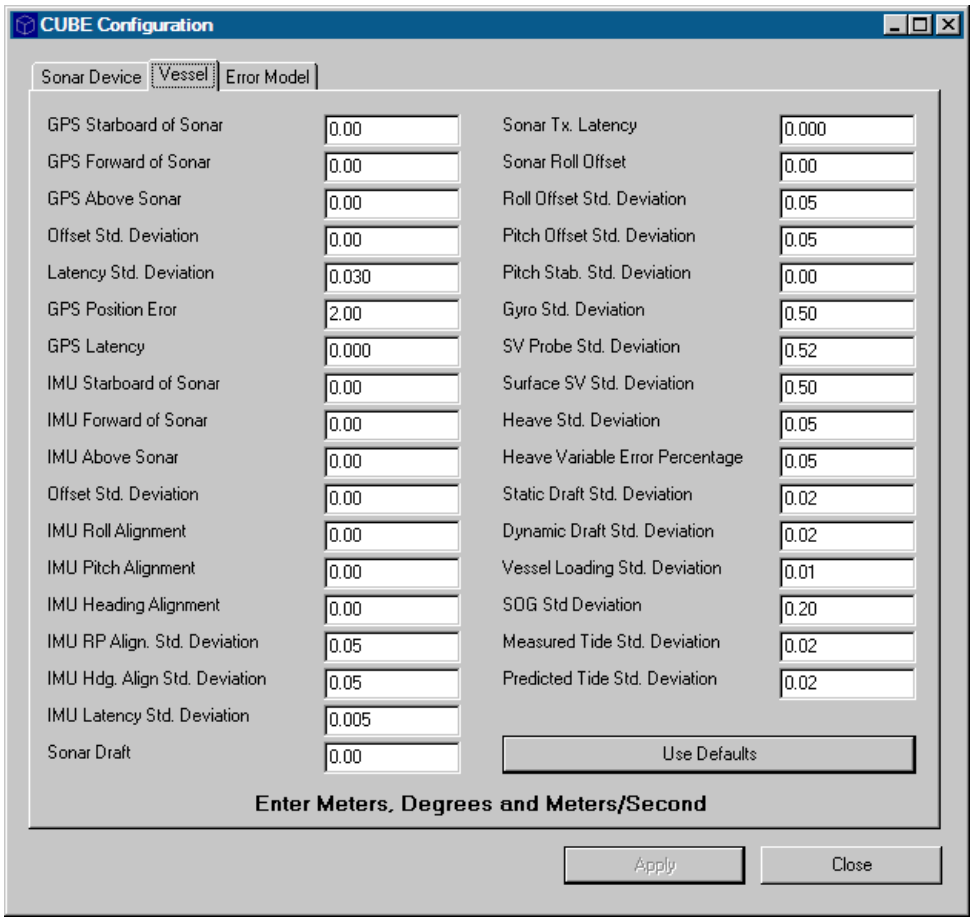
Factors Affecting Uncertainty Calculations

The **Vessel tab** includes parameters used in calculating the uncertainty associated with each sounding. If you are uncertain about any of it, rest assured that, once you enter your GPS to Sonar offsets, the remaining default values are useable. However, if you've completely researched

your equipment and installation, you may wish to over-ride the default values.

NOTE We don't use offsets included in the HS2 file as they don't take pre-calculated lever arms into account. (For example, POS / MV and Coda Octopus F180 relocate position to the IMU. For these devices, the offsets must still be entered here to provide information for HYSWEEP® CUBE to calculate such things as the lever arm effect. It will not double correct for position.)

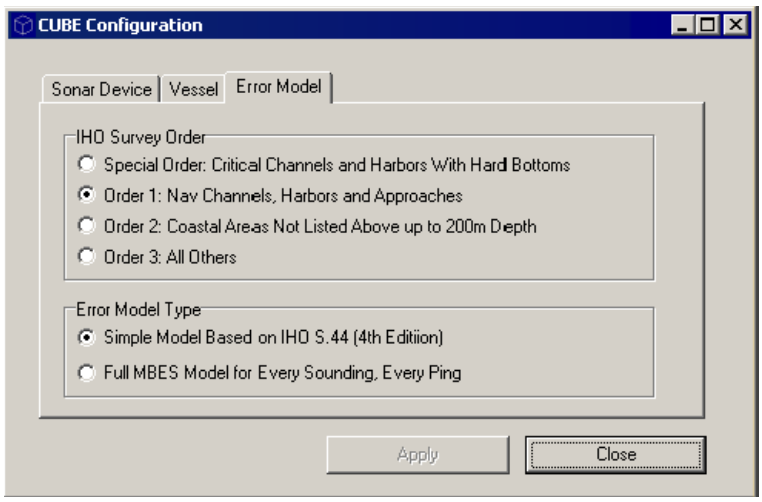
FIGURE 6-4. *Vessel Tab*



Choosing the Error Model

IHO survey order is used to reject soundings exceeding error limits defined for the survey type. Use the 'Full MBES Error Model' if your sonar is among those listed. The IHO model is not as complete and estimates depth errors primarily as a function of depth.

FIGURE 6-5. *Error Model Tab*

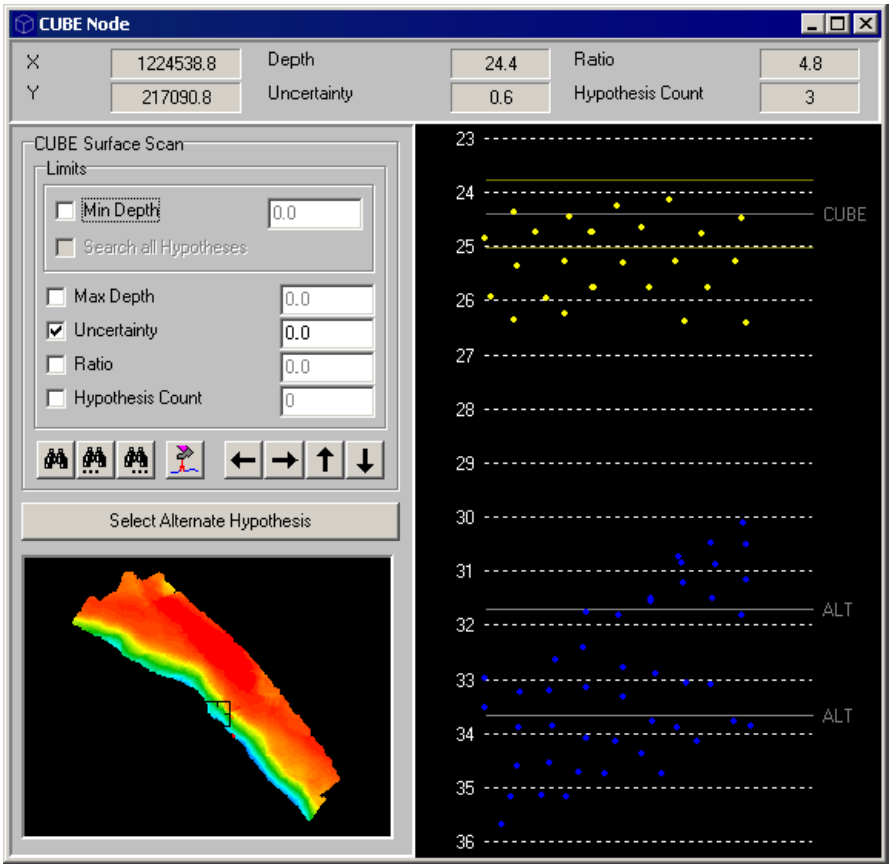


HYSWEEP® CUBE WINDOWS

Two windows are shown simultaneously with the shell in HYSWEEP® CUBE during the editing phase. The Grid window provides an overview of the data set and includes a cursor at the position that is displayed by the Node window in detail.

NODE WINDOW IN HYSWEEP® CUBE

FIGURE 6-6. *HYSWEEP® CUBE Node Window*

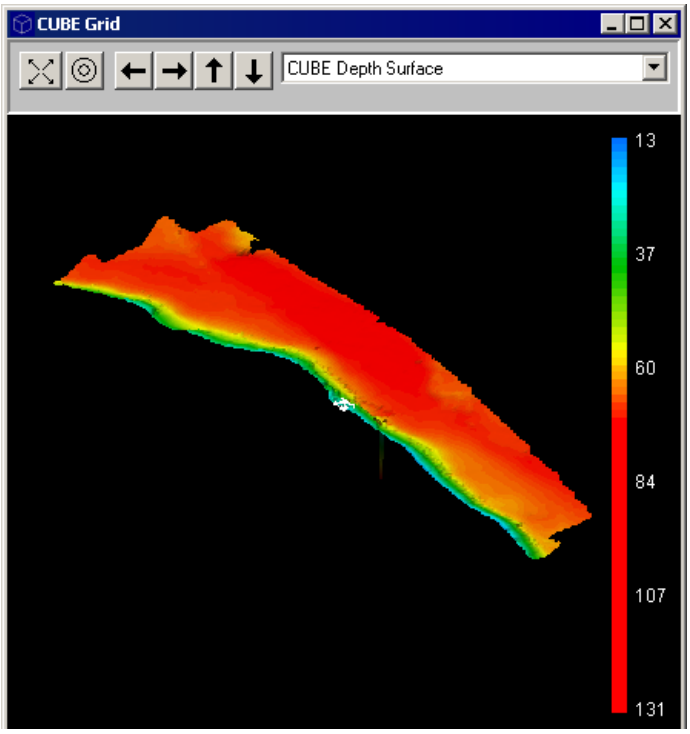


The Node Window displays all information for a CUBE node:

- The **status bar** at the top shows node easting and northing and the four CUBE surface values.
- The **profile view** shows the CUBE depth estimate and uncertainty bounds along with all soundings falling within the node.
- The **soundings area** is color-coded by survey line.
- The **map view** shows the entire depth surface with a cursor to show present location.

GRID WINDOW IN HYSWEEP® CUBE

FIGURE 6-7. *HYSWEEP® CUBE Grid Window*



The Grid window provides visualization of CUBE surfaces to assist the editing process.

- CUBE Depth
- Uncertainty
- Ratio
- Hypothesis Count

Select the surface of interest using the drop-down list then use the Angle, Rotation, Z-Scale and Zoom sliders to adjust the model for optimal viewing.

- **Angle** turns the model around the X axis.
- **Rotation** turns the model around the Z-axis.
- **Z-Scale** exaggerates vertical changes in your data

A cursor is overlaid on the surface at the location of the node currently displayed in the Node window. The cursor moves across the surface as you navigate and scan.

VIEW OPTIONS IN HYSWEEP® CUBE

The view options in HYSWEEP® CUBE determine what data appears in the display windows and how the windows should be configured to optimize the display.

- The lighting controls can be used to position a light source--a virtual sun-- above the data displays.
- The settings in the **View Options** dialog determine how the data should be displayed. Each of the HYSWEEP® CUBE windows is configurable to a certain extent. Range settings are adapted to expected bottom depths, display styles are selected to the operators personal preference and need.
- **To automatically arrange all windows**, select VIEW-TILE WINDOWS (Ctrl + F9). The program attempts to size and position all open windows for optimum viewing.

POSITIONING A LIGHT SOURCE OVER YOUR DATA MODEL

The light is positioned, by default, directly over the data. However, you can reposition the light to simulate shadows which accentuate the contours in your data. This can be helpful in detecting small depth variations and anomalies.

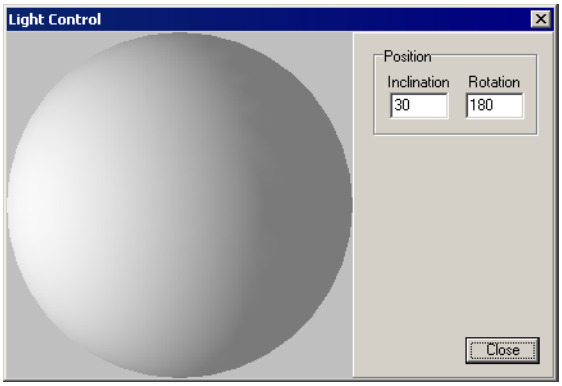
Two factors position the light:

- **Rotation** moves the light source horizontally around the data.
- **Inclination** adjusts the height of the light source from directly above to the level of the horizon.

To position the virtual light source:

1. **Open the Light Control dialog** by selecting VIEW-LIGHT CONTROL.

FIGURE 6-8. *Light Control Dialog*



2. **Set the direction and angle of inclination**.
   - **Type the Inclination and Rotation** in the corresponding text boxes.

TABLE 6-1. Inclination and Rotation Angles

Inclination	0	On horizon
	90	Directly above
Rotation	0	East
	90	North
	180	West
	270	South

- **With your cursor**, click on the graphic at the location at which you want the light. The Rotation and Inclination values will automatically update accordingly.

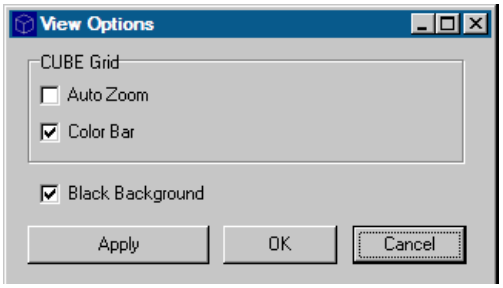
The lighting effect will automatically update in your data model.

OTHER VIEW OPTIONS IN HYSWEEP® CUBE

In addition to the controls for the grid window display, the view options dialog provides additional display settings.

To access the View Options dialog select VIEW-OPTIONS (F9).

FIGURE 6-9. View Options Dialog



Auto Zoom aligns the current node to the center of the Grid window. Zoom and rotate occur about this point. If this option is cleared, zoom and rotate occur about the center point of your data set.

Color Bar displays a legend on the right side of the Grid Window.

Black Background toggles between black and white backgrounds in both windows.

EDITING YOUR DATA WITH HYPACK® HARDWARE

Now that you have your data loaded into the program, eliminated the largest errors through your Read Parameter filters, and set your display options in HYSWEEP® CUBE, you are ready to put CUBE to work. You can edit by user-selected hypotheses or accept the hypotheses with the least uncertainty.

EDITING BY USER-SELECTED HYPOTHESES

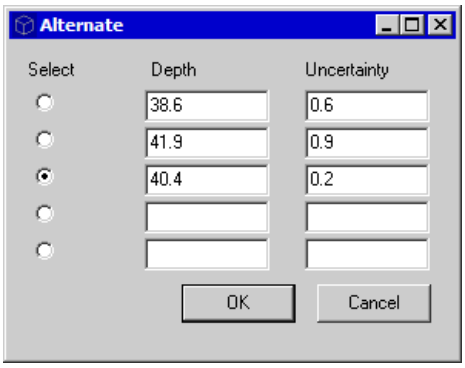
To edit by user-selected hypotheses, you scan your data for points outside user-defined limits. In each case, choose what you think is the most likely hypothesis.

1. **In the Node window, set your limits for CUBE surface scanning**.
   - **Minimum** and **Maximum Depth** may not be useful if the read filters have been used to remove soundings outside known limits.
   - **Uncertainty** may be useful, but there is a catch. The CUBE algorithm assigns high uncertainty to nodes at the edge of the survey. This is reasonable except it makes scanning on uncertainty limits tedious; almost all hits are at the edges.
   - **Ratio:** A high ratio indicates a suspect depth estimate and scanning for ratios greater than 2 will often locate suspicious depths.
   - **Hypothesis Count:** Multiple hypotheses are also cause for suspicion. Scanning for hypothesis count greater than 1 will locate nodes where CUBE was unable to estimate depth without some level of ambiguity. You are allowed to select between CUBE depth hypotheses using the drop-down list provided in the Node window.
2. **Scan your data for a node that falls outside of your CUBE parameters.** You can navigate through the survey:
   - **Manually** through the cells one-by-one using the arrow buttons.
   - **Automatically** using the Binocular Icons.

     - **Start Scan** (left) begins your scan at the beginning of your dataset and finds the first point that falls outside any of your scan limits.
     - **Scan Forward** (right) and **Scan Back** (center) search for the next and last point outside of your scan limits respectively.
3. **Choose the final output for each point found by the scan**. When a node is found outside scan limits, it is up to you to decide to:
   - **Delete the node completely** (unlikely) by clicking the 'Remove Node from CUBE Surface' button.

   - **Choose an alternate depth hypothesis**. Click [Select Alternate Hypothesis] in the Node window and a list of hypotheses will be displayed, each with their level of uncertainty. Select a different solution and click [OK]. The Grid window display will update according to your selection.

FIGURE 6-10. Choosing an Alternate Hypothesis



- **Accept the initial CUBE hypothesis:** do nothing; just continue scanning.

4. **Continue to scan through your data,** choosing the depth for each found point, until you reach the end.
5. **Save your data.** Your data will be saved to an XYZ file which will be placed, by default, in your Sort directory.

EDITING BASED ON LEAST UNCERTAINTY

CUBE scans the data, calculating all hypotheses and uncertainties, and accepting the depths with the least uncertainty. It's a purely mathematical and automatic process.

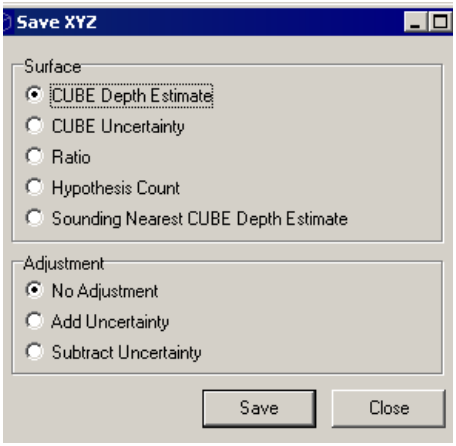
1. **Load your data to CUBE**.
2. **Select EDIT-MINIMIZE UNCERTAINTIES**. The program will process your data automatically and display a "Scan Complete" message when it is finished.
3. **Save your data**.

SAVING FILES FROM HYSWEEP® CUBE

You can choose to save values from any of the CUBE surfaces or the true sounding nearest to the depth estimated by CUBE.

1. **Select FILE-SAVE TO XYZ.** The Save XYZ dialog appears.

FIGURE 6-11. Save XYZ Dialog



2. **Select the value for export**.
   - Remember, the '**CUBE Depth Estimate'** isthe HYSWEEP® CUBE best estimate of the depth at each location; it is not a true sounding.
   - To save true sounding values, select '**Sounding Nearest CUBE Estimate**'.
   - The remaining options save statistical information generated in HYSWEEP® CUBE and saved as survey quality control information.

- **Select the Adjustment Option.** You can save your selected depth estimates. Alternatively, you can save the depth estimates plus or minus their uncertainty value which provides a data set of shoalest or deepest possible with high certainty.

3. **Click [Save]**.

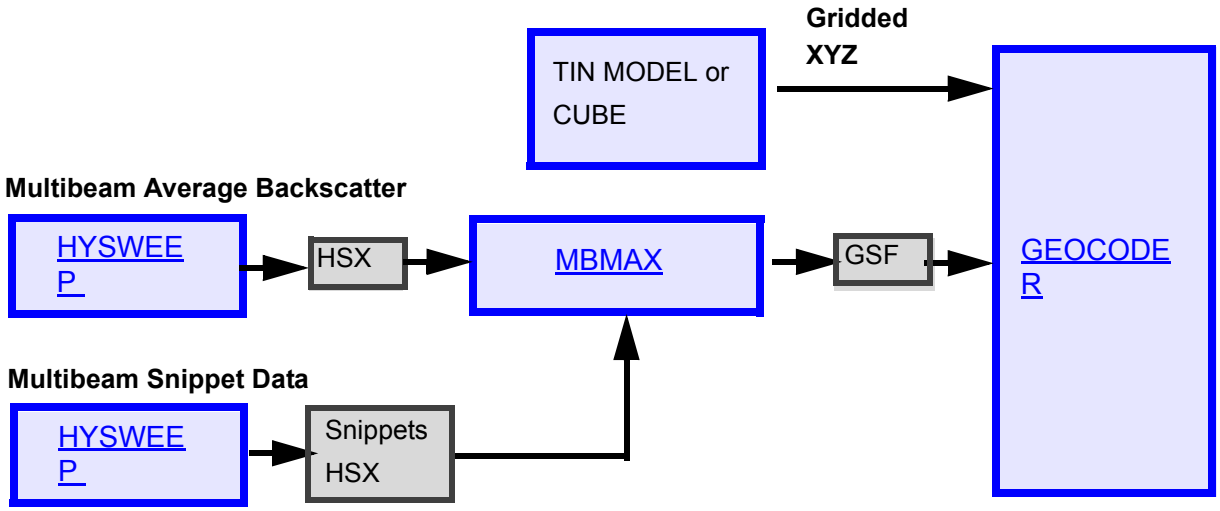
The Save dialog remains open until you click [Close] to allow you to save more than one set of surface values.

GEOCODER™ WITH MULTIBEAM SNIPPETS

GEOCODER™ is a program developed by Dr. Luciano Fonseca of the Center for Coastal and Ocean Mapping (CCOM) at the University of New Hampshire. The purpose of GEOCODER™ is to produce multibeam backscatter mosaics and ARA (Angular Response Analysis) seafloor characterization. It may also be used to generate mosaics of side scan data. GEOCODER™ has been licensed by HYPACK, Inc. for inclusion in HYPACK® software.

The following figure summarizes how each type of HYPACK® data is processed to format it correctly for GEOCODER™.

FIGURE 6-1. *Side Scan Flow Chart*



Multibeam data with backscatter or snippet information can be used in GEOCODER™ for the following purposes:

- **To create average backscatter mosaics from HS2 or GSF** (Generic Sensor Format) files generated by HYPACK® and by other vendors. First, process your HSX data in the HYSWEEP® EDITOR where you can apply corrections. In Phase 2, you can save your edited data to HS2 or GSF format.
- **To create snippet mosaics from HS2 or GSF files** generated by HYPACK® and others. GEOCODER™ is the only means available through HYPACK® for snippet processing. You must first, process your HSX data in the HYSWEEP® EDITOR where you can apply corrections and merge the binary snippet data. In Phase 2, you can save your edited data to GSF format.
- **To characterize the seafloor in terms of mean grain size using Angular Response Analysis (ARA).**

NOTE: We recommend that you use HS2 format over GSF format in GEOCODER™. GSF files were the original format supported in

GEOCODER™, but HS2 fomat data provides more extensive information.

RUNNING GEOCODER™ WITH MULTIBEAM DATA

1. **Run your multibeam data through the HYSWEEP® EDITOR.**
   a. **Load the backscatter data** (HSX) or snippet data (HSX + binary snippet data). Select one or more HSX files. If there are corresponding binary files, the program will load them automatically.
   b. **Save it out to GSF format** from Phase 2 of the HYSWEEP® EDITOR.
2. **Launch the GEOCODER™** by selecting SIDE SCAN-GEOCODER™.
3. **If this is the first time loading the data set to GEOCODER™, select FILE-NEW SESSION.**
4. **Load your data**.
   a. **Select the data source from Source menu**.

Data type	Source Selection
• Multibeam Average Backscatter • Data with Intensity Only (GSF)	Select 'Beam Averages'
Snippets Data (GSF)	Select 'Beam Time Series'

   b. **If you are reading snippet data, enter calibration settings**.
   c. **Load the area bathymetry.** (Optional) Click [...] next to the DTM (digital terrain model) field and choose the file. The program supports the following file formats:
      - **A gridded XYZ file:** The TIN MODEL, CUBE or MAPPER program can output the gridded XYZ file from your bathymetric data.
      - **A matrix file:** Load your data to the HYSWEEP® EDITOR and, in phase 3, save it in a matrix with zero rotation and cells of equal height and width.

      With a DTM, the data is factored into the calculations when the mosaic is constructed.

      Without a DTM, GEOCODER™ will assume a flat bottom.

      To remove a DTM from your session, select FILE-UNLOAD DTM.
   d. **Enter mosaic options**. (Optional) If you want to restrict the extent of the mosaic to the area covered by the DTM, you should check the 'Lock' option under 'Extents' in the Mosaic Options

dialog. You can set the other options at the same time, but it may make more sense to wait until you have loaded your side scan data.

e. **Load your multibeam data.** Select FILE-INSERT LINE and choose one or more HS2 or GSF files. Track lines appear as the program reads each file.

5. **Save the session. (Optional)** Select FILE-SAVE SESSION, and provide a name. The data, along with your current settings, will be saved with a GPR extension, by default, to your project folder.
6. **If you have loaded data with intensity data only, build your mosaic**. GEOCODER™ uses the sample intensity as the beam average, if beam average doesn't exist. Otherwise, continue to the next step.
   a. **Click [Make Mosaic].** The program will merge the data to form the mosaic.
   b. **Export your mosaic to a geo-referenced TIF** by clicking [Save Tiff] and naming your output file.
7. **Adjust calibration settings and mosaic options if necessary.**
   - **To modify calibration settings on individual lines,** click on the line in the graphic, then [Calibrate Settings]. Change the required options and click [OK].
   - **To modify your mosaic options**, click [Mosaic Options], change the required options and click [OK]. If you have not checked them already, you should definitely verify that you have the proper settings at this time.
8. **Check the Histogram and recalculate the dB if necessary.** The Histogram defines the range of return used for the mosaic. It's good practice to check it before you build your mosaic. The typical average backscatter should beabout -25.
   a. **Click [HISTOGRAM].**
   b. **If your average backscatter is significantly different than -25 and you are using ARA select HISTOGRAM-CALCULATE DB SHIFT**.
9. **Set the menu options for the data you want to calculate**:
   - **For ARA**, select ARA-CALCULATE ON MOSAIC.
   - **For Statistics**, select STATISTICS-CALCULATE ON MOSAIC.
   - **For Histogram**, select HISTOGRAM-CALCULATE ON MOSAIC.
10. **Build your preliminary mosaic** (Optional) by clicking [Make Mosaic]. This build gives you a baseline against which you can compare mosaics built after beam pattern and ARA adjustments. It also calculates the data designated in the previous step.

NOTE: These values should also be recalculated if you change settings that affect the histograms.

---

11. **Extract, apply and save your beam pattern**.
12. **Apply ARA (Angular Response Analysis) adjustments**. (Optional) These are more accurate on snippet data because it is represented more uniformly than backscatter data.
13. **Adjust and reapply your histogram if necessary**. The histogram is often affected when you adjust for the beam pattern and ARA. You may need to recalculate the histogram to optimize your mosaic.

    To recalculate the histogram:

    - **To update the histograms without building the mosaic**, select ARA-CALCULATE NOW and HISTOGRAM-CALCULATE NOW.
    - **To update the histograms when building the mosaic,** select ARA- CALCULATE ON MOSAIC and HISTOGRAM-CALCULATE ON MOSAIC.
14. **Build your final mosaic** by clicking [Make Mosaic].
15. **Adjust the ARA view opts** as necessary.
16. **Save the mosaic to a geo-referenced TIF file** by clicking [Save TIFF].

More Information

- "Saving and Loading Projects in GEOCODER™" on page 6-98.
- "XYZ Export from TIN Models" on page 7-138
- "HYSWEEP® CUBE" on page 6-77
- "MAPPER" on page 6-112.
- "Calibration Settings in GEOCODER™" on page 6-92
- "GEOCODER™ Mosaic Options" on page 6-96
- "Adjusting your Data for Multibeam Beam Patterns" on page 6-99
- "Adjusting for Angular Response Analysis in Multibeam Data" on page 6-102

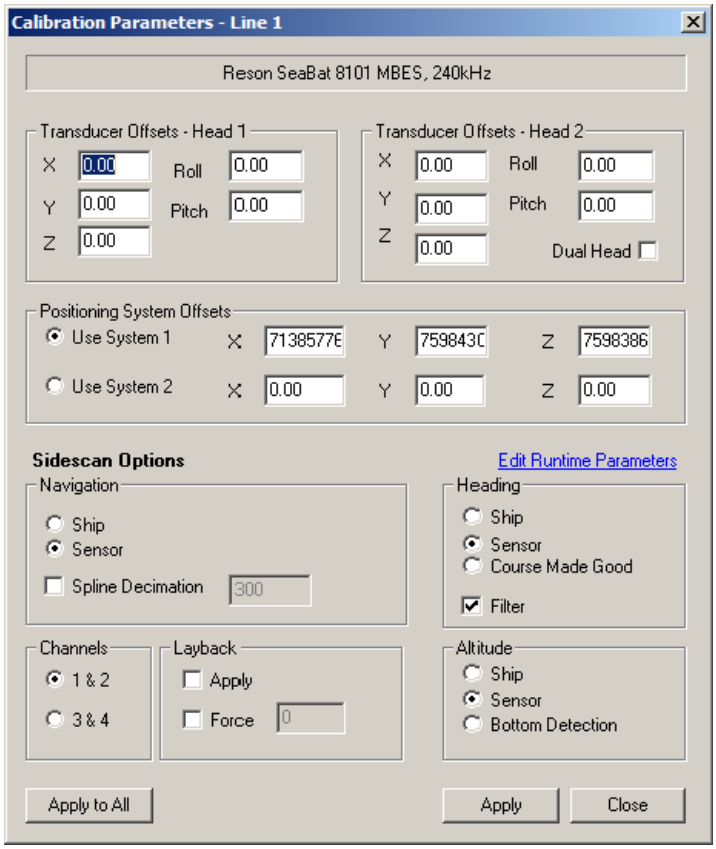
CALIBRATION SETTINGS IN GEOCODER™

The calibration settings confirm the hardware offsets that were configured to before the survey, and define the sources from which the side scan data should be read to construct the mosaic.

To access the calibration settings, click [Calibration Parameters].

The calibration settings set prior to loading the data are applied to *all* lines as they are loaded to the program. You *can*, however, apply different calibration settings to individual lines *after* the data has been loaded. To do this, select a line, click [Calibration Settings], enter the settings for that line and click [Close].

FIGURE 6-2. *Calibration Parameters Dialog*

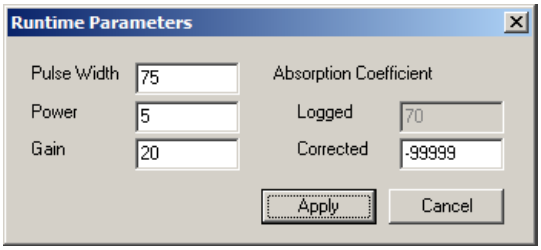


- **Verify offsets.** These fields are automatically populated based on data read from the line files. If you surveyed with erroneous offsets, enter the correct offsets here. The program will implement the corrected offset information in its output. *This will not affect the raw data*.
- **Side scan options:** Select the source from which GEOCODER™ should read each type of data.
  - **Heading** defaults to Ship heading if towfish heading is not found.
  - **Navigation** defaults to Ship position if towfish position is not found. **Spline Decimation** accounts for any curves in the trackline in calculating the positioning of the swath.
  - **Altitude:** We log only 1 altitude in the RSS record, which can be from your configuration. Select either '**Ship**' or '**Sensor**' to use the altitude data from the RSS record.

    If you choose the '**Bottom Detection**' option, GEOCODER™ uses its own algorithms to determine the bottom.
  - **Channels**: Select the frequency GEOCODER™ should use.
  - **Layback**:
    - **Apply** the layback calculated during survey or
    - '**Force**' GEOCODER™ to use a constant user-defined layback value.

- **Runtime Parameters** include information about your device settings (ex. pulse widths, power and gain). Normally, GEOCODER™ reads this information from your data files. If your data does not include this information, click the link and enter the values in the Runtime Parameters dialog. Any runtime parameters you enter will be ignored if the data already exists in your line files.

FIGURE 6-3. *Runtime Parameters Dialog*

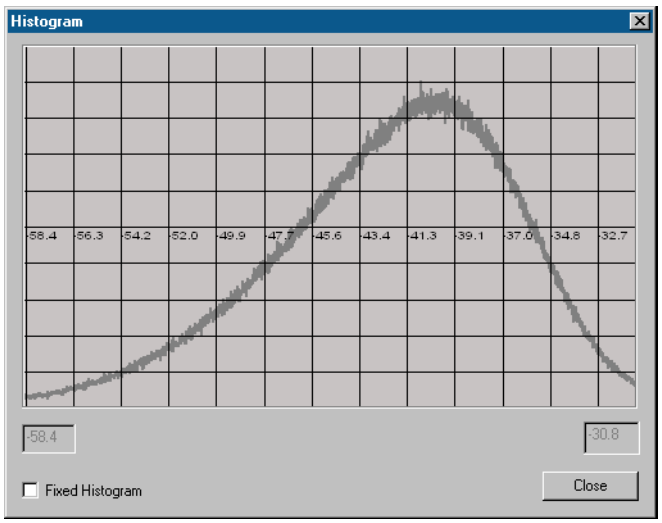


RECALCULATING THE HISTOGRAM

When GEOCODER™ reads your data, it automatically determines the decible range of your data set and saves the data to a histogram that you can view by clicking [Histogram]. The colors represented in the Histogram window are determined by the option selected in the View menu.

GEOCODER™ bases the coloration of your backscatter mosaic, your ARA and your statistics on histograms. When GEOCODER™ calculates the Angular Response Analysis (ARA) and statistics, it also determines the range of values and assigns a spectrum of color-codes across the range. There are histograms that represent the full ARA range as well as subsets of that range.

FIGURE 6-4. Sample Histogram



Adjustments for beam pattern and ARA may affect your histograms in such a way that they should be recalculated after those adjustments have been made. Recalculating the mosaic histogram will provide optimal results in drawing the mosaic.

1. **Set your view options to match the histogram you want to recalculate**.

TABLE 6-1. View Options affect Histogram Recalculations

View Menu Selection	ARA menu Selection	Histogram Recalculated
Backscatter Mosaic	(Not Applicable)	Mosaic
ARA	Total	ARA for full swath range
ARA and Mosaic	Near	ARA for beams nearest nadir
	Far	ARA for mid-range beams
	Outer	ARA for beams farthest from nadir
	Grain Size	Grain Size
	Impedance	Impedance
	Roughness	Roughness
	Distance	Distance

2. **Recalculate the ARA and Statistics Histograms.** You can do this using either of two methods:
   - **In the ARA and Statistics menus, select CALCULATE NOW.** This option just does the calculations for the ARA or Statistics without rebuilding the mosaic.
   - **Calculate the histogram when you next build the mosaic**.
     i. **Check ARA-CALCULATE ON MOSAIC and STATISTICS-CALCULATE ON MOSAIC.**

ii. **Click [Make Mosaic]**. The recalculation is done, the 'Calculate Now' selection in the ARA menu becomes disabled, and the graphic redraws according to your view options.

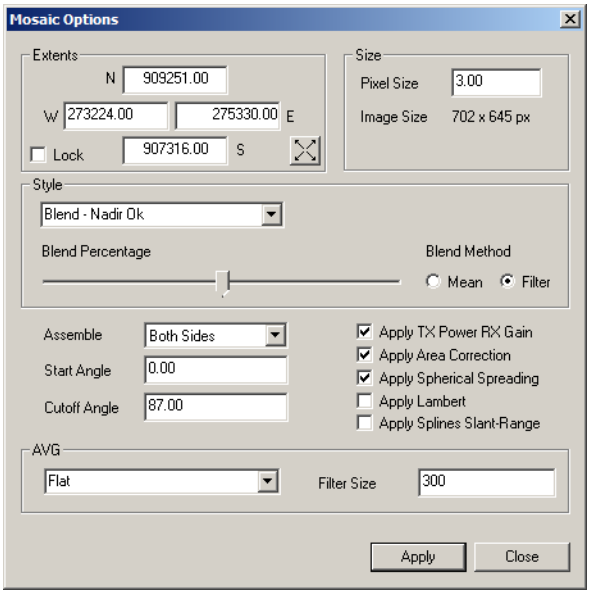
Typically, the range calculated by GEOCODER™ is appropriate. If this is not the case, you can do either of the following:

- **Calculate a dB Shift:** If the data set is outside of the expected decibel range, you can move your whole dataset by a constant amount into an appropriate range. **Select HISTOGRAM-CALCULATE DB SHIFT**. You must re-calculate the histogram for this shift value to take effect.
- **Override the calculated range:**
  a. In the Histogram window, **check 'Fixed Histogram'** .
  b. **Enter your own minimum and maximum levels**.
  c. **Press the Enter key** and the histogram will redraw. The program will apply this range to the mosaic or ARA display when the mosaic is next built.

GEOCODER™ MOSAIC OPTIONS

The mosaic options provide instructions for building the mosaic from the data you have loaded.

FIGURE 6-5. *Mosaic Options Dialog*



Extents displays the geographic range to be covered by the mosaic. It automatically adjusts to the full extents of all data that has been loaded to

the project. However you can set your own area by editing the values and checking the Lock option.

To restore the values to the extents of the data, click the zoom extents button.

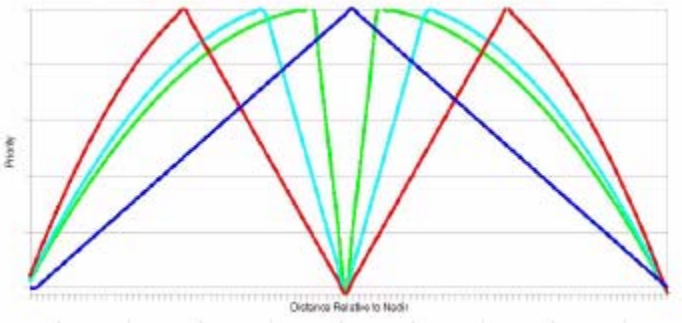
TIP: You can restrict your mosaic to the extents of the DTM by checking the 'Lock' option after loading only the DTM. Or you may manually edit the values and lock them.

Pixels Size determines the resolution of the mosaic. A smaller pixel size increases the resolution, as well as the file size of the finished mosaic.

Style:

- **No Nadir options:** Eliminate the nadir data and underweights the defined percentage of the swath (10%, 25%, 50%) extending from the nadir. If your nadir data is noisy, this option will eliminate it. The remaining values are underweighted more toward nadir and progressively less outward from nadir to the defined percentage. Underweighting indicates data of less quality and affects the blending with overlapping data.
  Nadir OK includes the data from the nadir beam in the mosaic.

FIGURE 6-6. *No Nadir 10% (green), 25% (Aqua), 50% (Red), Nadir OK (Blue)*



- **Blend:** Overlapping data is mixed based on the chosen style and Blend Percentage.
- **Blend Percentage Slider:** Affects the blending based on the relative weights of overlapping data. Once each value in each swath is weighted by your style option, the program compares the weights of the overlapping data. Logically, if the overlapping data is weighted equally, you would want both sets reflected in the blend. If, however, the data is weighted very differently, you would want the program to use the better data.
  - **With the slider far to the right**, blending will almost always occur, even though their weighting is quite different.
  - **With the slider far to the left**, the program will usually present the data from the data set with the greater weight.

- **With the slider at a mid-range position**, the two methods are combined.

- **Mean**: This is a straight average of overlapping data values.
- **Fill Gaps:** Data from the selected line is used only where there is no other overlapping data. This is useful if you have a line with a few gaps. You can re-run the same line, but remosaic using the second one to fill the spaces in the first.
- **Overlay** brings the selected line to the top when the mosaic is drawn.
- **Delete** omits the line from the m osaic. This option should only be applied to select lines. (If it were applied to all line, you would have no data left with which to build a mosaic.)

TIP You can quickly preview possible changes to the mosaic layering w/ a quick keystroke combination. These options are for display purposes only and will revert to the true settings the next time the screen redraws (zoom, pan, change view option).
Alt + Double-click: Line drawn on top
Shift + Double-click: Line drawn on bottom
Ctrl + Double-click: Line omitted from the drawing.

Assemble: You can elect to use data from port, starboard or both to build your mosaic.

Start and Cutoff Angles, relative to nadir, define the range of beams to be included in your mosaic. This option allows you to omit noise around the nadir and at the outer edge.

'Apply' options: When the program reads the side scan data, it separates the components. This enables you to chooose which of them should be included in the mosaic. By default, TX Power RX Gain, Area Correction and Spherical Spreading are checked.

AVG Filter: These options assume a flat bottom. Use 'Trend' to apply the DTM. **Filter size** is the number of pings affected by the AVG option. The default value is 300.

SAVING AND LOADING PROJECTS IN GEOCODER™

A GEOCODER™ project includes information read from your data based on the your GEOCODER™ settings that were in effect at the time.

To save a GEOCODER™ project, select FILE-SAVE SESSION. The project will be saved with a GPR extension to your project folder.

To load an existing GEOCODER™ project, select FILE-LOAD SESSIONand select the required GPR file.

Advantages of GEOCODER™ projects:

- If, at some time, you need to reload the same data and start again, it will be faster to load the GPR file than to reload the original data files.
- You can easily compare the results of different setting combinations.

TIP: If you save your project at each stage of your process, you can then quickly return to that point without repeating all the step to reload the data and settings.

Disadvantages to GEOCODER™ projects:

- **Each saved project requires a large amount of hard drive space** because it includes the data information as well as the current settings.

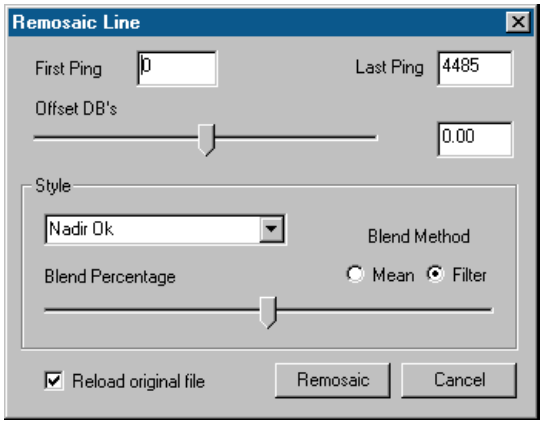
ADJUSTING YOUR DATA FOR MULTIBEAM BEAM PATTERNS

Multibeam systems have many sounding beams over a range of angles relative to the nadir, and with some variation in strength. By analyzing some sample data collected over a flat bottom of uniform composition (for example, sand), we can calculate the angle and strength of each beam and save it to a beam pattern file. We can then factor this information into the calculations used to build the next mosaic and determine bottom type.

To extract the beam pattern:

1. **Collect data over a flat, sandy bottom**.
2. **Load the data to GEOCODER™**.
3. **Select BEAM PATTERNS-EXTRACT BEAM PATTERN** and enter the ping range you want to include.

FIGURE 6-7. *Remosaic Line Dialog*

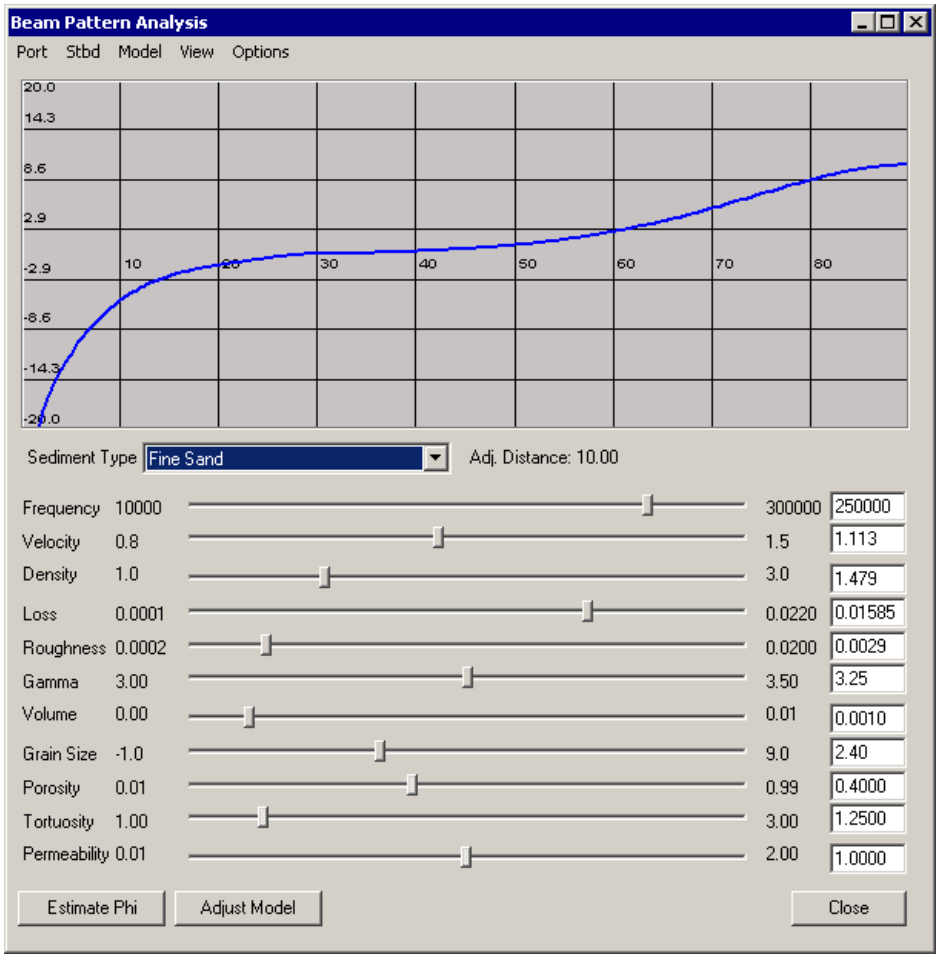


- **First and Last Ping**: Enter the ping range to be included.
- **Offset DB's** (decibels): Use the slider to enter a constant value to add to each decibel value in your data. Changing the strength of the return affects the brightness of the mosaic.

- **Style**:
  - **Nadir OK** includes the data from the nadir beam in the mosaic.
  - **No Nadir:** If your nadir data is noisy, this option will eliminate it.
  - **Blend**: Overlapping data is mixed with user-defined percentages. Set the percentage of the selected line with the Blend Percentage slider.
  - **Fill Gaps:** Data from the selected line is used only to where there is no other overlapping data.
  - **Overlay** brings the selected line to the top when the mosaic is drawn.
  - **Delete** omits the line from the mosaic. This option should only be applied to select lines. (If it were applied to all line, you would have no data left with which to build a mosaic.)
- **Blend Method and Percentage** determines how overlapping data will be handled.
- **Reload original file:** Check this option and GEOCODER™ will reread the data file instead of its representation currently in memory. There is no harm in checking this option, but it takes longer than using what is already in memory. There are times, however, when you may want to be sure you are starting again with the original data. (If you have saved your project, reloading the project may serve the same purpose, depending on when you saved it.)

4. **Click [Remosaic]**. The Beam Pattern Analysis will display.

FIGURE 6-8. *Sample Beam Pattern Analysis*



5. **Select the sediment type** corresponding to the bottom type over which you collected your data. The graph will adjust accordingly.
6. **Click [Close]**.
7. **Save the beam pattern** by selecting BEAM PATTERN-SAVE BEAM PATTERN and supplying a name. The file will be saved with a BPT extension, by default, to the project folder.

You only need to extract and save the beam pattern once for each system. On subsequent projects just load the beam pattern file.

To apply the beam pattern:

1. **Select BEAM PATTERN-LOAD BEAM PATTERN**.
2. **Select BEAM PATTERN-APPLY BEAM PATTERN**.

NOTE: This menu item toggles on and off each time you select it. To apply the beam pattern, the item should be checked before moving on to the next step.

ADJUSTING FOR ANGULAR RESPONSE ANALYSIS IN MULTIBEAM DATA

Angular Response Analysis (ARA) is another set of calculations that uses the beam pattern. It compares the strength of return and the angle from nadir of each beam over a user-defined number of pings to calculate the bottom type. The beam pattern is factored into the strength of return calculations for increased accuracy.

NOTE: This calculation uses the data across the entire swath, and assumes that the bottom type is uniform across the entire swath.

1. **If you intend to export seabed ID data, select ARA-FORMAL INVERSION.** The inversion calculations are automatically done, port and starboard, during the mosaic build.
2. **Calculate the ARA.**
   a. Select ARA-CALCULATE ON MOSAIC.
   b. Click [Make Mosaic]. The data will be remosaicked taking the ARA calculations into account.
3. **View your ARA. (Optional)** When GEOCODER™ calculates the ARA, it also determines the range of values and assigns a spectrum of color-codes across the range. You can view this data in the mosaic window.
   a. Select VIEW-ARA or VIEW-ARA AND MOSAIC.
   b. Select one of the display options in the ARA menu.
      - **Total**
      - **Near** (10-30 degrees from nadir)
      - **Far** (30-55 degrees from nadir)
      - **Outside** (< 55 degrees from nadir)
      - **Grain Size**
      - **Impedance**
      - **Roughness**
      - **Distance:** The adjustment distance between the ARA model and the snippet data.

TIP: To omit data with unacceptable adjusted distance values click [Program Options] and set the Maximum Adjusted Distance. Data whose distance value exceeds this distance will be ignored. The default value is one.

The first four options designate whether to view the whole swath or a portion of it, relative to the nadir beam. Colored squares representing the ARA in the designated area of the swath will appear in the mosaic area.

NOTE: If you recalculate the histogram (HISTOGRAM-RECALCULATE ON MOSAIC) while you have one of

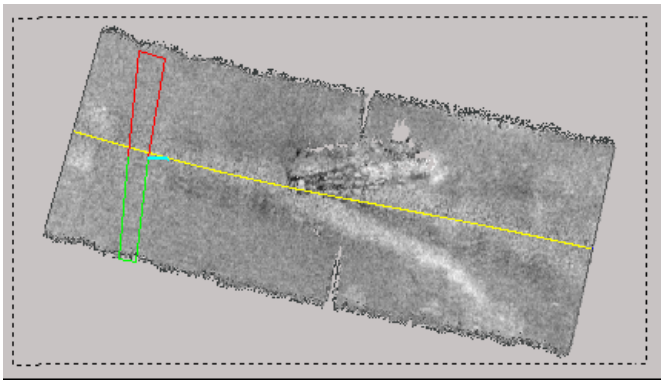
the ARA options selected in the View menu, GEOCODER™ will recalculate the ARA range selected in the ARA menu.

4. **Estimate your bottom type through a patch analysis.**
   a. **Set the number of pings in your swath.**
      i. Click [Program Options].
      ii. Under Patch Size, enter the number of pings.

      NOTE: Choose a number of pings that, considering the width of your swath and your speed, creates a square patch.

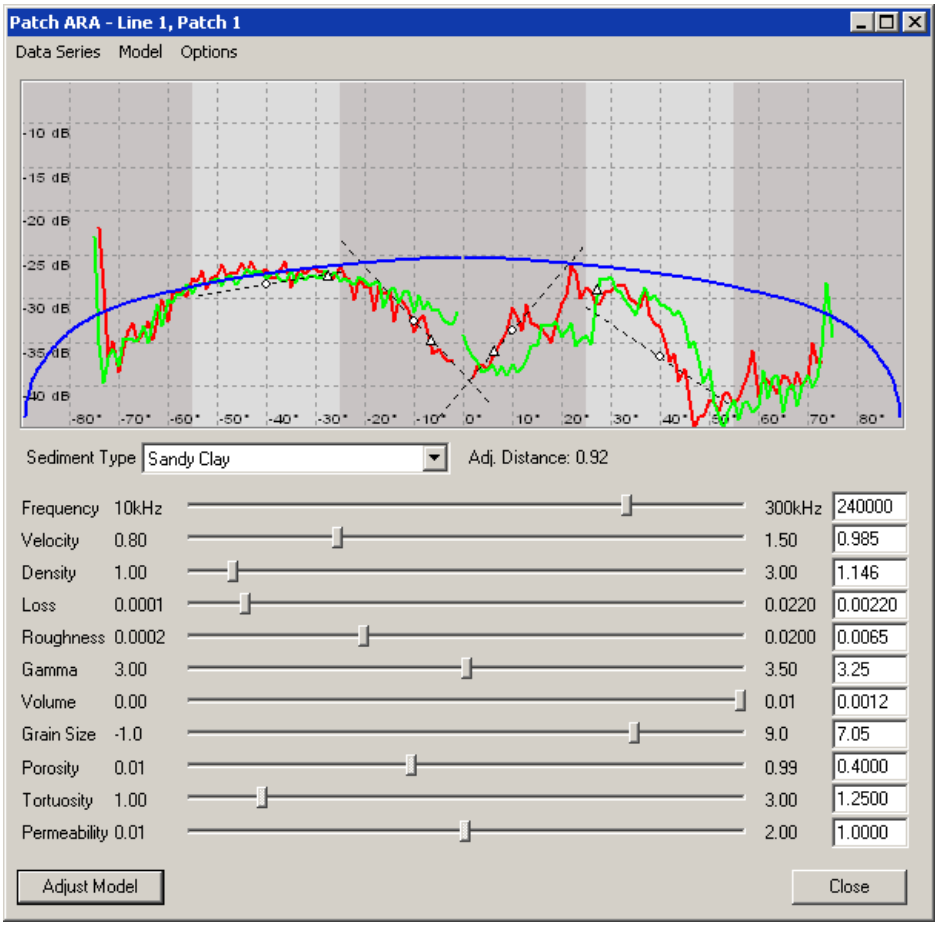
      iii. Click [OK].
   b. **Select a swath of data.** Click on the center line of your mosaic where the bottom is uniform across the swath. A rectangle defining the range of the swath will overlay the mosaic. (The rectangle is defined by drawing lines perpendicular to the center line. If the center line is not straight, the rectangle will not be a parallelogram.)

FIGURE 6-9. *Selecting the Swath for the Patch ARA*



   c. **Select ARA-VIEW PATCH ARA.** A window will appear with a display of data in the selected swath (red and green) and an ARA model (blue).

FIGURE 6-10. *Sample ARA Model*



The ARA model is a calculated estimate of the true bottom type based on the measured data.

NOTE: By default, the calculations are based on the port data. You can force the calculations to be based on the starboard data by selecting MODEL-ADJUST TO STARBOARD.

---

5. **Estimate the bottom type by clicking [Adjust Model].** The ARA Model moves to conform as closely as possible to our measured data. The inferred bottom characteristics are updated accordingly and the estimated bottom type appears under ‘Sediment Type’. The Adjusted Distance should be small. A large adjusted distance (a value greater than 1) suggests the bottom is not uniform.

TIP: To omit data with unacceptable adjusted distance values click [Program Options] and set the Maximum Adjusted Distance. Data whose distance value exceeds this distance will be ignored. The default value is one.

6. **Save the bottom type data .** (Optional)

- **To an X, Y, Z, SeabedID file.** Select ARA-SAVE XYZ GRAIN SIZE. The SeabedID numbers generated by GEOCODER™ range from 0-19 where 0 is the most coarse classification and 19 is clay.

FIGURE 6-11. *Exerpt from an XYZ, ID File*

273437.04 907797.09 0.00 4.46

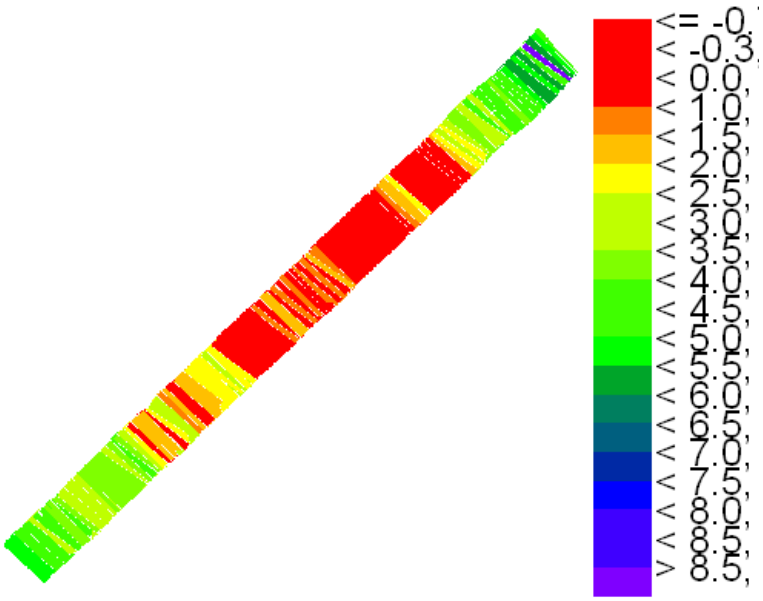
273462.96 907746.45 0.00 4.46

273565.87 907803.85 0.00 4.53

273576.43 907814.73 0.00 4.53

- **To a DXF file.** Select ARA-SAVE DXF. The program analyzes the seabed data and defines areas of similar bottom type then color-codes them and generates a DXF with a legend defining each bottom type.

FIGURE 6-12. *Seabed DXF*



NOTE: Remember, these options only work if you selected the Formal Inversion before calculating your ARA.

CALCULATING STATISTICAL INFORMATION

GEOCODER™ can calculate a lengthy list of statistical data from your backscatter data at a user-defined grid spacing.

The program first divides the data into bins of user-defined size, then calculates the statistics for each bin. The resulting statistics are color-

coded and displayed with your mosaic or backscatter model, or just on their own.

Calculating the Statistics

To calculate statistics:

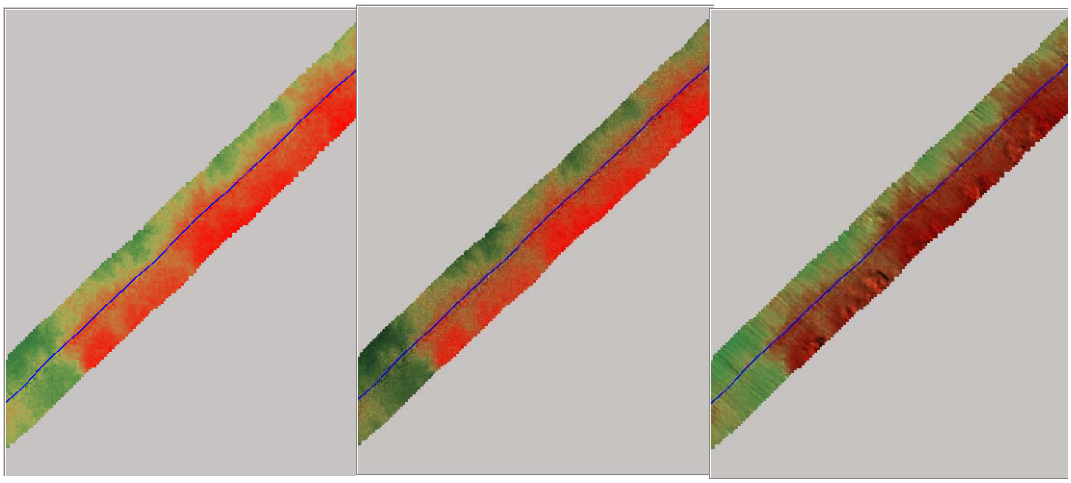
1. **Click [Program Options] and set your Statistics Options.**
   - **Bin size:** Average number of points per bin. This value should be a multiple of your pixel size.
   - **Use Image GLCM: If you want to calculate GLCM statistics, check 'Use Image GLCM'**. Otherwise, they will not be calculated.
2. **Select STATISTICS-CALCULATE ON MOSAIC**.
3. **Click [Make Mosaic].** All items in the Statistics menu should be enabled.

Configuring your Statistical Display

To display your statistical results:

1. **Select one of the Statistics options in the View menu**.
   - Statistics
   - Statistics and Mosaic
   - Statistics and Bathymetry

FIGURE 6-13. *Sample Mean Values - Statistics (left), Statistics And Mosaic (center) and Statistics And Bathymetry (right)*



2. **Select the value that you want to display from the Statistics menu**. The display will update according to your selections.
3. **Save the results as a geo-referenced TIF.** (Optional).

More Information

- "Saving the Mosaic as a Geo-referenced TIF" on page 6-107

SAVING GEOCODER™ RESULTS

If you've gone through the effort to mosaic your data, it's safe to assume that you would want to save the results in some format.

Supported output formats from multibeam data include:

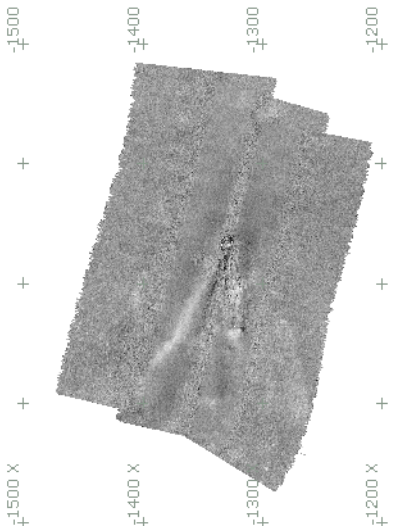
- Geo-referenced TIF files
- X, Y, Backscatter
- X, Y, Z, grain-size or DXF of Angular Response Analysis Seabed data.

SAVING THE MOSAIC AS A GEO-REFERENCED TIF

A geo-referenced TIF can be loaded to any HYPACK® program that supports background charts. This allows you to display your mosaicked data in the context of your other project files.

To save your mosaic as a geo-referenced TIF select FILE-SAVE GRAYSCALE TIFF (or click [Save TIFF]), or select FILE-SAVE COLOR TIFF and provide a name. The chart file of *only the mosaicked data* will be saved with a TIF extension to the name and place you define.

FIGURE 6-14. *Displaying a Geo-referenced TIF in HYPACK®*



- **A screen capture of the mosaic window**. This includes the tracklines and the border around the mosaic. This is also a geo-referenced TIF, but the resolution is not as good as what you can generate with to the geo-referenced TIF.

  To save a screen capture:

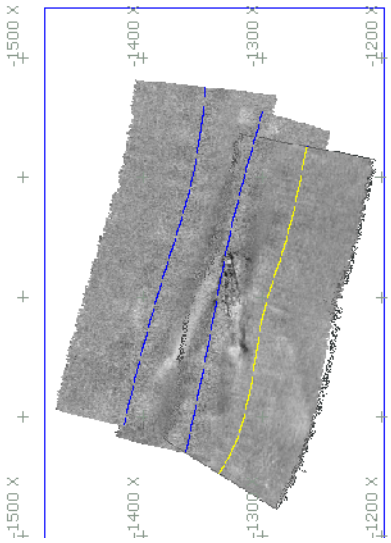
  a. **Set your TIFF output options** in the Program Options dialog.
     - **Write GeoTif** (embedded TFW).
     - **Write TFW** file enables you to generate a separate file that contains coordinates that describe the location, scale, and

rotation of the TIF. It is used by geographic information systems (GIS) software for locating areas in raster map images.

- **Use LZW Compression**: This is a lossless compression algorithm that significantly reduces the resulting file size without losing resolution of the image.

b. **Select FILE-SAVE VIEW AS TIFF** and provide a name.

FIGURE 6-15. *TIF Screen Capture*



SAVING THE MOSAIC TO XY, BACKSCATTER FORMAT

If you built the mosaic from backscatter data, you can export the data in X, Y, Backscatter format. Select FILE-SAVE XYB and name your output file in the File Save dialog.

- **Save with the default 'XYB' extension** to export them to third-party programs that read ASCII text.
- **Save with an XYZ extension** if you want to read them them into any HYPACK® program that reads XYZ data.

TIP: In this case, consider a filename that will distinguish it from sounding data.

SAVING YOUR ARA SEABED DATA

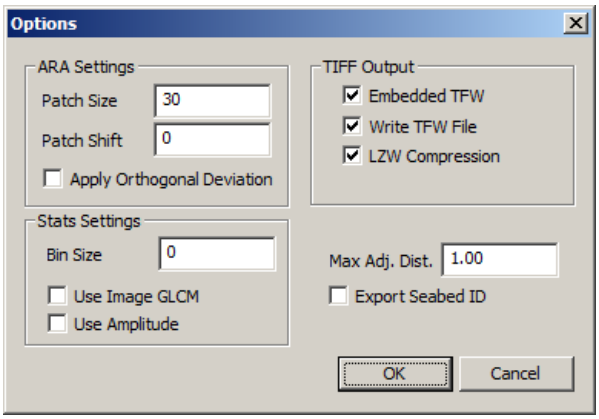
If you have used the Angular Response Analysis (ARA) to run a patch analysis, you can export your seabed data in XYZ-Grain Size or DXF format.

A **patch** is an area as wide as your swath and extending longitudinally for the number of pings specified under '**Patch Size**' in the Program Options

dialog. The '**Patch Shift**' determines the ping number at which the analysis begins.

TIP: For best results, the Patch Size should be calculated, taking the boat speed into account, to result in patches of equal height and width (square patches).

FIGURE 6-16. *Program Options Dialog*



During the **patch analysis**, GEOCODER™ uses the gradient and intercept values to classify the bottom types in your project area.

- **To export to an X, Y, Z, Grain Size (*.xyzid) file,** select ARA-SAVE XYZ GRAIN SIZE. This option outputs the positions of the corners and center of each patch. The Z value comes from the DTM (digital terrain model) file at that location. (If there is no DTM, all Z values will be zero.) The fourth, 'ID' component in the output depends whether you have checked the 'Export Seabed ID' option in the Program Options dialog.
  - **If you check the 'Export Seabed ID' option**, the ID value will be a number from 0-19 where 0 is the most coarse classification and 19 is clay.
  - **If you clear the 'Export Seabed ID' option,** the ID value will be the grain size.

FIGURE 6-17. *Exerpt from an X, Y, Z, Grain Size File*

273437.04 907797.09 0.00 4.46

273462.96 907746.45 0.00 4.46

273565.87 907803.85 0.00 4.53

273576.43 907814.73 0.00 4.53

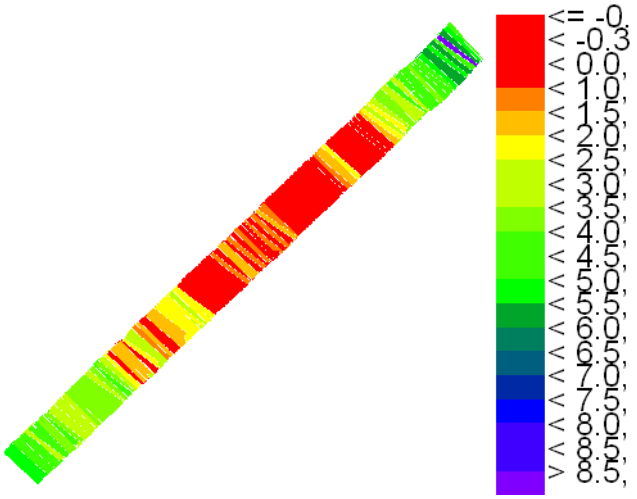
TIP: You can obtain a more dense data set by exporting multiple datasets, each with a different Patch Shift value, then merging the datasets together.

For example, if your Patch Size is 30 pings, you could export one set of data using a Patch Shift of zero and another with a Patch Shift of

15. Use a text editor to merge the two XYZid files to get one XYZid file with points every 15 pings down line.

- **To export a DXF file,** select ARA-SAVE DXF. The program analyzes the seabed data and merges patches defining areas of like bottom type, then color-codes them and generates a DXF with a legend defining each bottom type.

FIGURE 6-18. *Seabed DXF*



NOTE: Remember, these options only work if you selected ARA-FORMAL INVERSION before calculating your ARA.

SOUNDING SELECTION PROGRAMS FOR MULTIBEAM SURVEYS

HYPACK® has two different routines for Sounding Selection for multibeam surveys. One may be more appropriate than another, depending on your final product. Before we go any further, let's look at the normal input to the different final product programs.

Program	Input Files
Cross Sections & Volumes	Edited files from the EDITOR program
Hyplot – Track lines	Edited files from the EDITOR program
Hyplot– Soundings	Sorted files from Sounding Selection routine
Export	Edited files or sorted files
TIN Model	Sorted files from Sounding Selection routine (unless you have a lot of time on your hands!)

COMPARISON OF SOUNDING SELECTION METHODS FOR MULTIBEAM DATA

The following sections take a closer look at the MAPPER and SOUNDING REDUCTION programs. These programs can be used as an alternative to the XYZ Reduction option in the HYSWEEP® EDITOR.

Method	MAPPER	SOUNDING REDUCTION
Input file Type	HS2 format SWP format XYZ format	ASCII XYZ
Output File Type	ASCII XYZ or XYZ ID Matrix (*.MTX)	ASCII XYZ
Other Files Needed	Matrix (*.MTX)	No
Plot Results Perpendicular to Planned Line	Yes, to the nearest active survey line.	Yes, to the nearest active survey line.
Guaranteed No Overwrites in Plotting	No	No
Sounding Selection	Minimum, Maximum, range, average, closest to cell center	None
Speed	Fast	Not bad for all that it does!

Method	MAPPER	SOUNDING REDUCTION
Maintains Sounding Location	Optional, depending on sounding selection	Yes
Pleasing to the Eye	Can be	"Beauty is in the eyes of the beholder."

NOTE: XYZ Reduction in the HYSWEEP® EDITOR produces the same results as MAPPER.

MAPPER

The **MAPPER** program is a "binning" or "gridding" program. It is normally used to reduce the voflume of multibeam or multiple transducer data, but it can also be used with single beam data.

You must first make a Matrix file (*.MTX) in the MATRIX EDITOR. A Matrix consists of a rectangular area filled with individual cells.

The MAPPER programs can save one sounding for each cell.

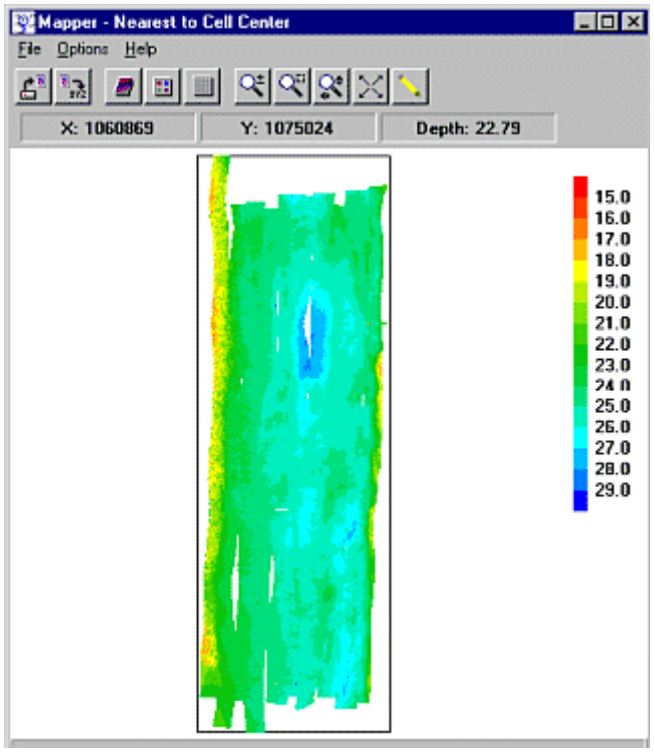
Advantages of MAPPER

- It is extremely fast
- It can be used to judge the quality (range per cell) of the data.
- It can be biased to select the data important to you.

Disadvantages of MAPPER

- Plotted soundings may overlap.
- You can move soundings if you elect to save the soundings at the center of the cell
- If your data is thin, there will be empty cells. MAPPER does not interpolate data.

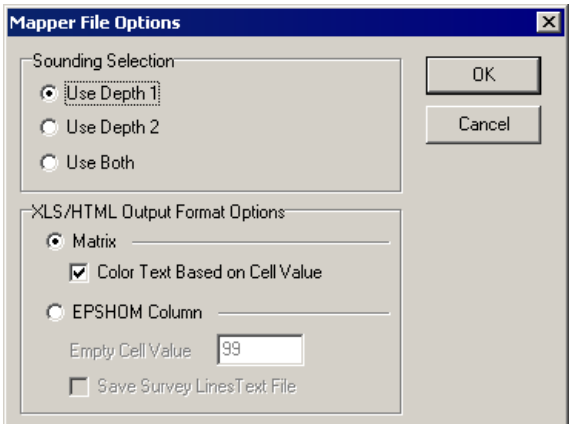
FIGURE 6-1. *Multibeam Data in MAPPER*



RUNNING THE MAPPER PROGRAM

1. **Create a Matrix File** (*.MTX) of your project area. The cell size in the matrix determines the density of data in the thinned data set.
2. **If you are mapping dual frequency data,** select the depth information you want MAPPER to read: depth 1, depth2 or both.

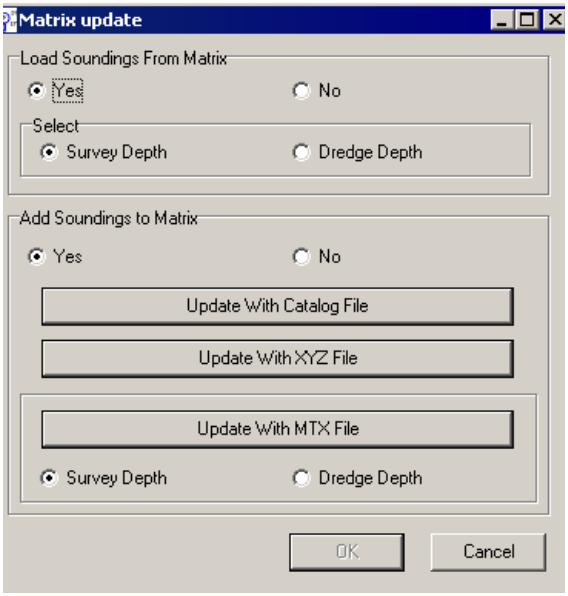
FIGURE 6-2. *Mapper File Options*



3. **Open your Matrix File** (*.MTX) by selecting FILE-OPEN MATRIX and choosing the correct file from the file selection dialog .
4. **Set the data to be included in the matrix** .

- **If you have chosen a filled matrix**, the Matrix Update dialog appears.

FIGURE 6-3. *Selecting the Data in your Matrix*



You have several choices. Notice, if you are using data from a filled matrix, you must indicate which depth to use as the Survey Depth in the new matrix. Any added soundings will overwrite the survey depths of the original matrix.

Data Loaded	Load Soundings From Matrix	Add Soundings To Matrix
Only the data the matrix already contains	Yes	No
Use the matrix boundaries, but load different sounding data	No	Yes and click the button corresponding to the type of the file where your data is currently saved to select from a file selection dialog.
Data contained in the matrix data merged with additional data.	Yes	Yes and click the button corresponding to the type of the file where your data is currently saved to select from a file selection dialog.

- **If you have opened an empty matrix or wish to add more sounding data to the current matrix**, select FILE-LOAD SOUNDINGS and choose the additional sounding files.

Once the data has been read into the Matrix, it is displayed in the MAPPER window.

5. **Set your mapping options.** There are several choices regarding the sorting and display of your data in MAPPER.

6. **Save your results** by selecting FILE-SAVE SOUNDINGS and your required output. You can you to save the current selections to your choice of several output formats:
   - **ASCII XYZ**: Used in other HYPACK® modules or read by a text editor.
   - **MTX file**: Used in other HYPACK® modules.
   - **XLS:** Microsoft Excel Spreadsheet format. (Require format options.)
   - **HTM:** Displayed in your web browser. (Output according to file options.)
   - **NetCDF:** Format for Fledermaus software. (Requires matrix file with '0' rotation.)

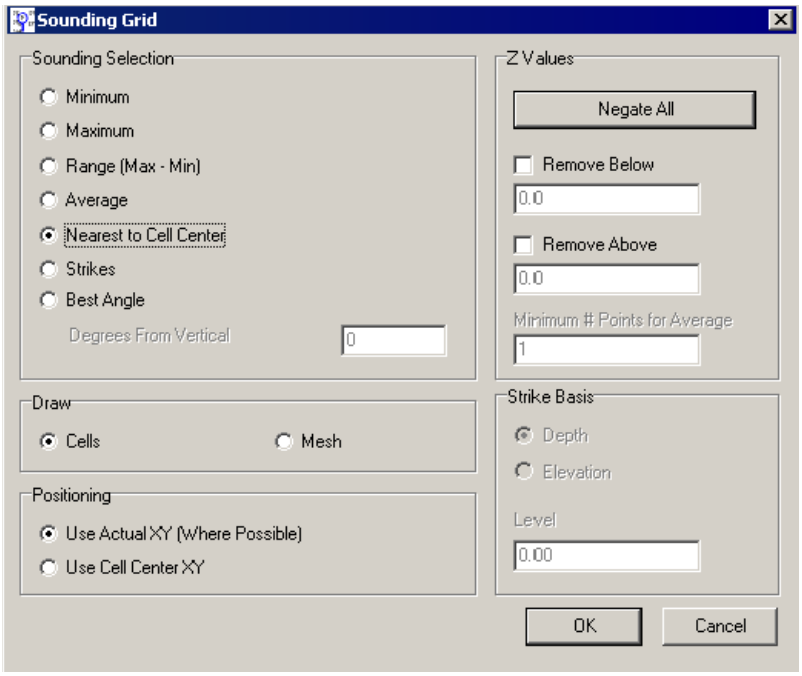
MAPPER OPTIONS

MAPPER DATA SELECTION OPTIONS

OPTIONS-DATA SELECTION specifies which item will be displayed and saved to file. It enables you to specify what information is displayed and if it is saved in its actual position or at the center of the matrix cell.

Most of the items are self-explanatory.

FIGURE 6-4. *Data Selections Window in MAPPER*



Sounding Selection determines which value will be saved to each matrix cell.

- **Minimum**
- **Maximum**
- **Range**

- **Average**
- **Nearest to Cell Center**
- **Strikes**
- **Best Angle**

Range is the maximum minus the minimum sounding value.

Strikes enables you to save and display only soundings that are above or below a user-specified **level**. It does not save the sounding, but saves the difference between the sounding and the specified level.

Strike Basis specifies whether the Strikes should be based on the amount the depth is less than the strike level (Depth) or the amount the depth is deeper than the strike level (Elevation).

Best Angle allows you to set which beam from a multibeam sensor is read to update the matrix by defining the angle from center.

NOTE The sounding nearest to cell center at its actual position will give you the best volumes calculations.

Draw lets you specify whether to draw the matrix presentation screen as solid color-filled cells or a wire mesh pattern.

Positioning enables you to save the data in its actual position (where possible) or in the center of the cell. When you save the data in the center of the cell, it moves the data, not always a great thing to do.

Z-Value Options:

- **[Negate All]** inverts all depths.
- **Remove Below and Above** omit all cells whose depths according to the user-defined criteria.

SOUNDING COLORS IN MAPPER

Select OPTIONS-COLOR CODING to access the Color Settings dialog. This is the same dialog that is used to set the colors in HYPACK®. Any changes made here will also affect HYPACK® and SURVEY.

More Information

- “Sounding Color Settings in HYPACK®” on page 1-34

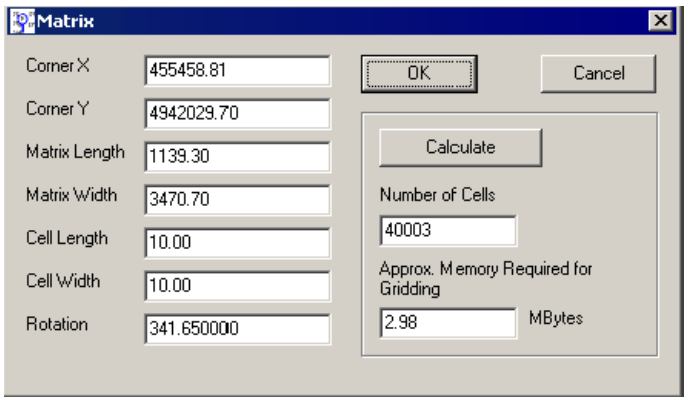
MAPPER MATRIX SETUP

OPTIONS-MATRIX SETUP enables you to edit the matrix parameters.

The number of matrix cells and the approximate memory required to use a matrix with the listed specifications in the binning process can be calculated and displayed by clicking [Calculate]. If you are not satisfied with the options, you can change the specifications for the matrix and recalculate.

NOTE If the matrix is changed, data must be re-read into the matrix, using the OPEN SOUNDINGS menu item .

FIGURE 6-5. The Matrix Setup Dialog



MAPPER MATRIX FILLS

The Options menu also enables you to:

- **Erase the data from a filled matrix** by selecting OPTIONS-CLEAR MATRIX.
- **Fill your matrix with a user-defined depth** by selecting OPTIONS-FILL MATRIX. The Fill Matrix dialog will appear for you to set the depth. Click [OK] and the results will be drawn to the MAPPER screen.

FIGURE 6-6. Fill Matrix Dialog

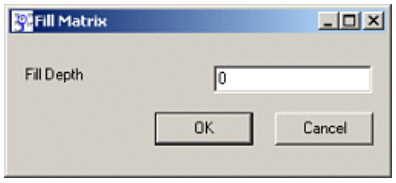
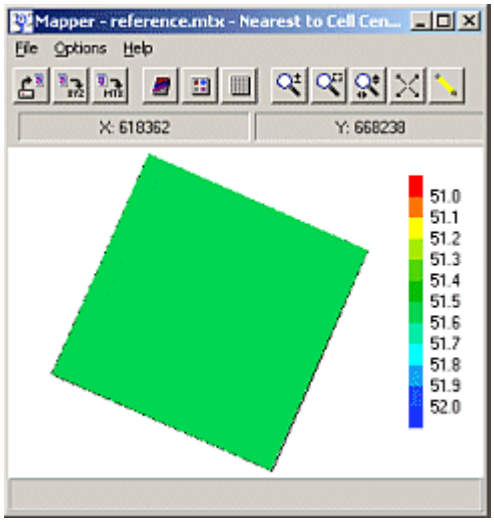


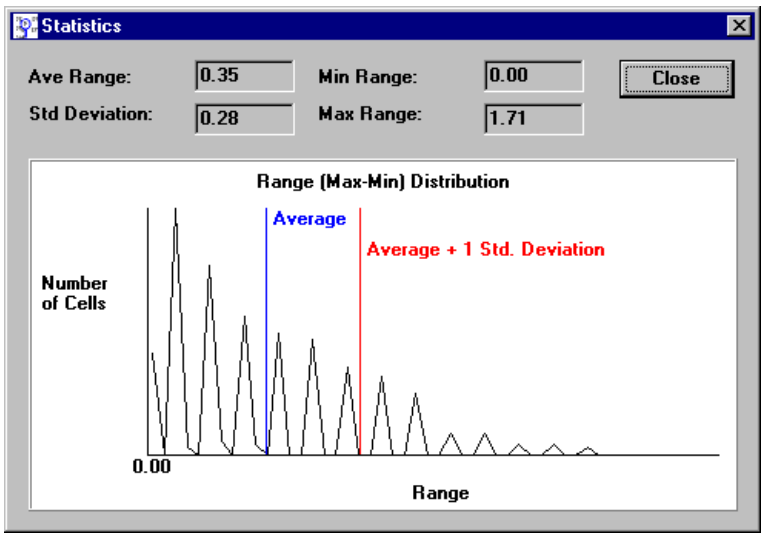
FIGURE 6-7. Matrix Filled with Uniform Depth



MAPPER STATISTICS

FILE-STATISTICS provides a plot of the Number of Data points vs. Depth Range per Cell.

FIGURE 6-8. *The Statistics Window in MAPPER*



EXPORTING DATA FROM MAPPER

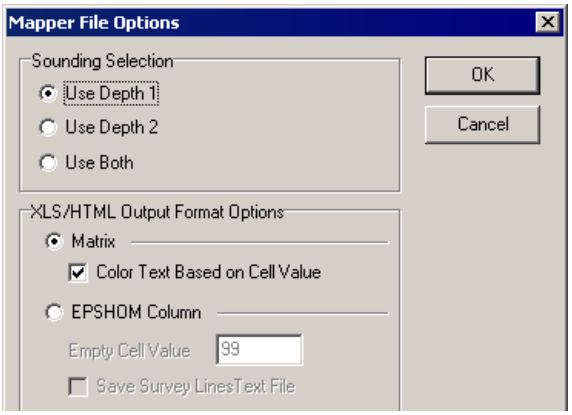
Once you have loaded your matrix and soundings, save your results. You have several output options.

- **ASCII XYZ**: Used in other HYPACK® modules or read by a text editor.
- **MTX file**: Used in other HYPACK® modules.
- **XLS:** Microsoft Excel Spreadsheet format. (Require format options.)
- **HTM:** Displayed in your web browser. (Output according to file options.)
- **NetCDF:** Format for Fledermaus software. (Requires matrix file with '0' rotation.)

If you want to export XLS and HTM, first check your output options in the Matrix File Options dialog.

To access the File Options dialog, select FILE-OPTIONS.

FIGURE 6-9. *Mapper File Options*



XLS/HTM Output Format Options:

- **Color Text Based on Cell Value** uses your project colors in your sounding output.

FIGURE 6-10. *HTML Output - Color Text Based on Cell Value*

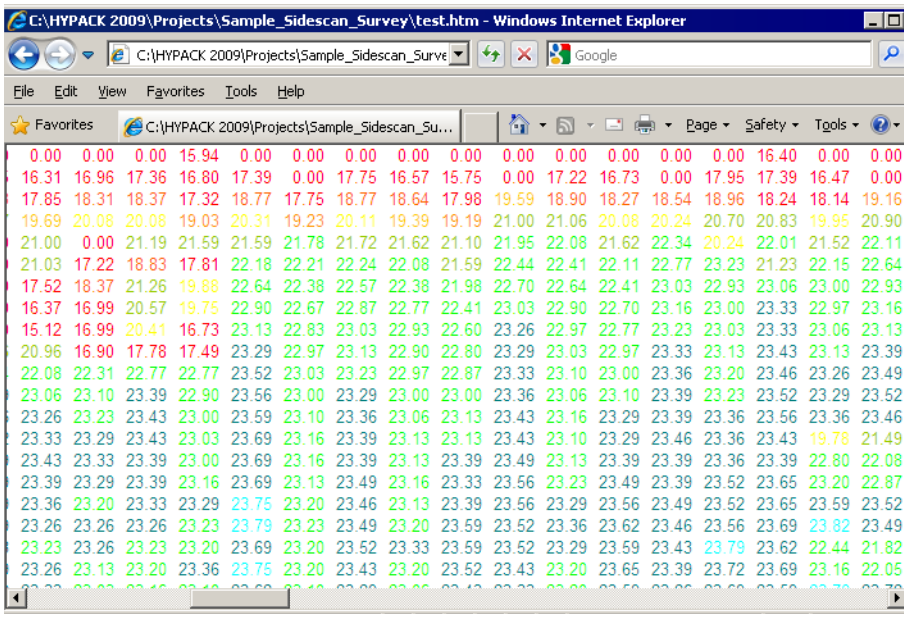
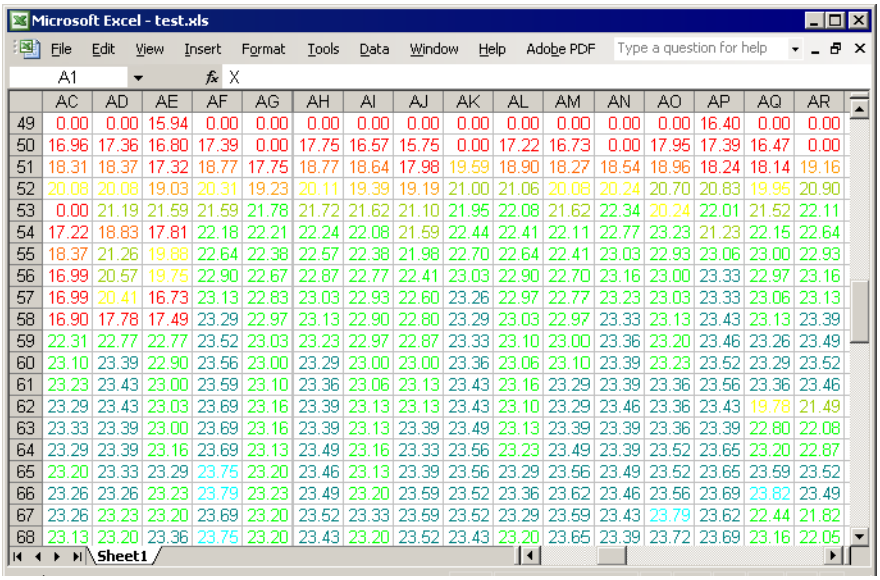


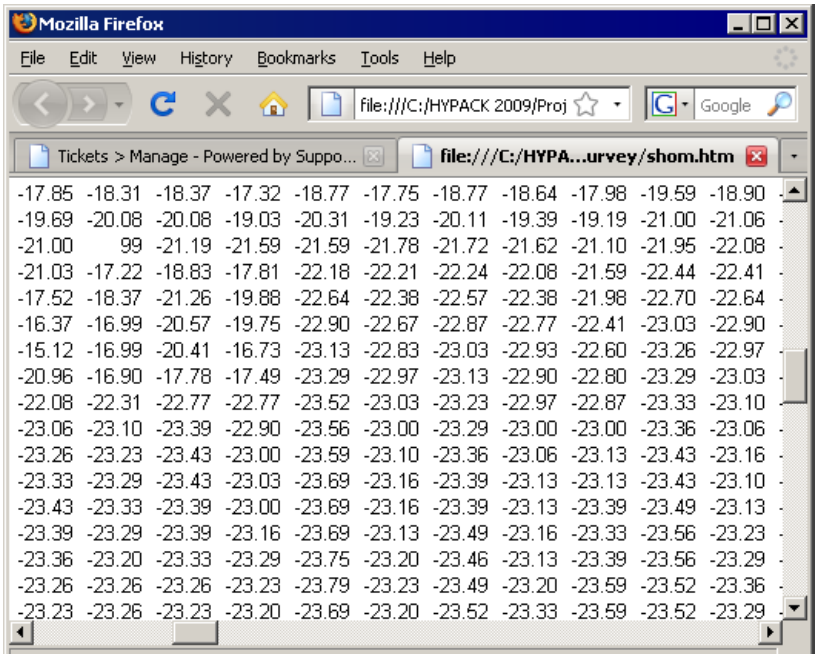
FIGURE 6-11. *XLS Output - Color Text Based on Cell Value*



	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
49	0.00	0.00	15.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.40	0.00	0.00
50	16.96	17.36	16.80	17.39	0.00	17.75	16.57	15.75	0.00	17.22	16.73	0.00	17.95	17.39	16.47	0.00
51	18.31	18.37	17.32	18.77	17.75	18.77	18.64	17.98	19.59	18.90	18.27	18.54	18.96	18.24	18.14	19.16
52	20.08	20.08	19.03	20.31	19.23	20.11	19.39	19.19	21.00	21.06	20.08	20.24	20.70	20.83	19.95	20.90
53	0.00	21.19	21.59	21.59	21.78	21.72	21.62	21.10	21.95	22.08	21.62	22.34	20.24	22.01	21.52	22.11
54	17.22	18.83	17.81	22.18	22.21	22.24	22.08	21.59	22.44	22.41	22.11	22.77	23.23	21.23	22.15	22.64
55	18.37	21.26	19.88	22.64	22.38	22.57	22.38	21.98	22.70	22.64	22.41	23.03	22.93	23.06	23.00	22.93
56	16.99	20.57	19.75	22.90	22.67	22.87	22.77	22.41	23.03	22.90	22.70	23.16	23.00	23.33	22.97	23.16
57	16.99	20.41	16.73	23.13	22.83	23.03	22.93	22.60	23.26	22.97	22.77	23.23	23.03	23.33	23.06	23.13
58	16.90	17.78	17.49	23.29	22.97	23.13	22.90	22.80	23.29	23.03	22.97	23.33	23.13	23.43	23.13	23.39
59	22.31	22.77	22.77	23.52	23.03	23.23	22.97	22.87	23.33	23.10	23.00	23.36	23.20	23.46	23.26	23.49
60	23.10	23.39	22.90	23.56	23.00	23.29	23.00	23.00	23.36	23.06	23.10	23.39	23.23	23.52	23.29	23.52
61	23.23	23.43	23.00	23.59	23.10	23.36	23.06	23.13	23.43	23.16	23.29	23.39	23.36	23.56	23.36	23.46
62	23.29	23.43	23.03	23.69	23.16	23.39	23.13	23.13	23.43	23.10	23.29	23.46	23.36	23.43	19.78	21.49
63	23.33	23.39	23.00	23.69	23.16	23.39	23.13	23.39	23.49	23.13	23.39	23.39	23.36	23.39	22.80	22.08
64	23.29	23.39	23.16	23.69	23.13	23.49	23.16	23.33	23.56	23.23	23.49	23.39	23.52	23.65	23.20	22.87
65	23.20	23.33	23.29	23.75	23.20	23.46	23.13	23.39	23.56	23.29	23.56	23.49	23.52	23.65	23.59	23.52
66	23.26	23.26	23.23	23.79	23.23	23.49	23.20	23.59	23.52	23.36	23.62	23.46	23.56	23.69	23.82	23.49
67	23.26	23.23	23.20	23.69	23.20	23.52	23.33	23.59	23.52	23.29	23.59	23.43	23.79	23.62	22.44	21.82
68	23.13	23.20	23.36	23.75	23.20	23.43	23.20	23.52	23.43	23.20	23.65	23.39	23.72	23.69	23.16	22.05

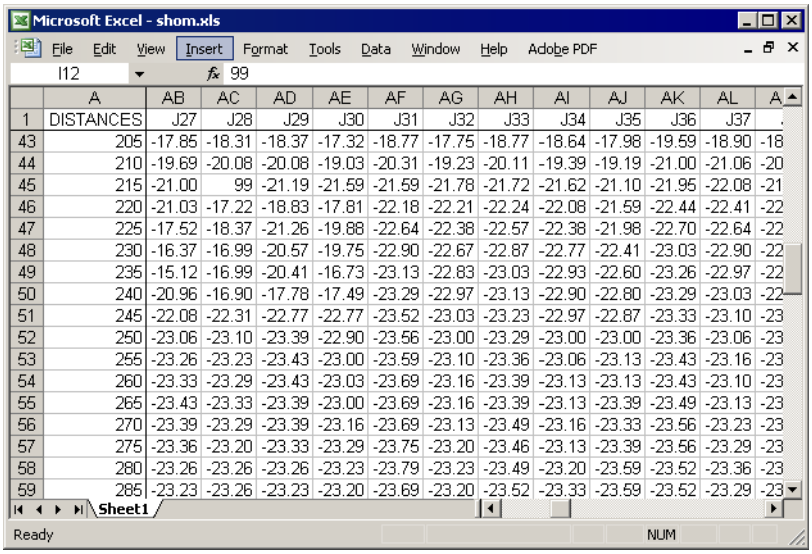
- The EPSHOM options always prints your soundings in black.
  - **Empty Cell Value** enables you to choose what value will be assigned to empty matrix cells.
  - **Save Survey Lines Text File** stores the EPSHOM XLS output, including column and row headers, to a text file where the cell delimiter is a forward slash.

FIGURE 6-12. *EPSHOM - HTM Output*



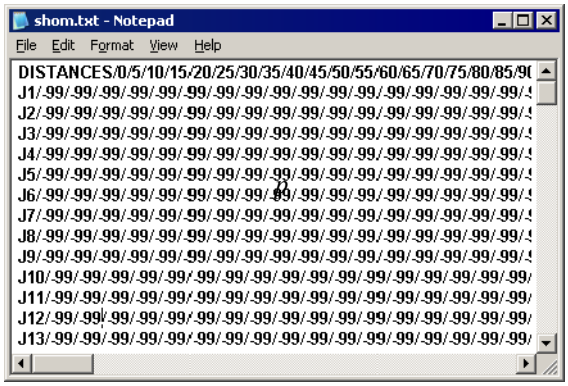
-17.85	-18.31	-18.37	-17.32	-18.77	-17.75	-18.77	-18.64	-17.98	-19.59	-18.90
-19.69	-20.08	-20.08	-19.03	-20.31	-19.23	-20.11	-19.39	-19.19	-21.00	-21.06
-21.00	99	-21.19	-21.59	-21.59	-21.78	-21.72	-21.62	-21.10	-21.95	-22.08
-21.03	-17.22	-18.83	-17.81	-22.18	-22.21	-22.24	-22.08	-21.59	-22.44	-22.41
-17.52	-18.37	-21.26	-19.88	-22.64	-22.38	-22.57	-22.38	-21.98	-22.70	-22.64
-16.37	-16.99	-20.57	-19.75	-22.90	-22.67	-22.87	-22.77	-22.41	-23.03	-22.90
-15.12	-16.99	-20.41	-16.73	-23.13	-22.83	-23.03	-22.93	-22.60	-23.26	-22.97
-20.96	-16.90	-17.78	-17.49	-23.29	-22.97	-23.13	-22.90	-22.80	-23.29	-23.03
-22.08	-22.31	-22.77	-22.77	-23.52	-23.03	-23.23	-22.97	-22.87	-23.33	-23.10
-23.06	-23.10	-23.39	-22.90	-23.56	-23.00	-23.29	-23.00	-23.00	-23.36	-23.06
-23.26	-23.23	-23.43	-23.00	-23.59	-23.10	-23.36	-23.06	-23.13	-23.43	-23.16
-23.33	-23.29	-23.43	-23.03	-23.69	-23.16	-23.39	-23.13	-23.13	-23.43	-23.10
-23.43	-23.33	-23.39	-23.00	-23.69	-23.16	-23.39	-23.13	-23.39	-23.49	-23.13
-23.39	-23.29	-23.39	-23.16	-23.69	-23.13	-23.49	-23.16	-23.33	-23.56	-23.23
-23.36	-23.20	-23.33	-23.29	-23.75	-23.20	-23.46	-23.13	-23.39	-23.56	-23.29
-23.26	-23.26	-23.26	-23.23	-23.79	-23.23	-23.49	-23.20	-23.59	-23.52	-23.36
-23.23	-23.26	-23.23	-23.20	-23.69	-23.20	-23.52	-23.33	-23.59	-23.52	-23.29

FIGURE 6-13. *EPSHOM - XLS Output*



	A	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	A
1	DISTANCES	J27	J28	J29	J30	J31	J32	J33	J34	J35	J36	J37	
43	205	-17.85	-18.31	-18.37	-17.32	-18.77	-17.75	-18.77	-18.64	-17.98	-19.59	-18.90	-18
44	210	-19.69	-20.08	-20.08	-19.03	-20.31	-19.23	-20.11	-19.39	-19.19	-21.00	-21.06	-20
45	215	-21.00	99	-21.19	-21.59	-21.59	-21.78	-21.72	-21.62	-21.10	-21.95	-22.08	-21
46	220	-21.03	-17.22	-18.83	-17.81	-22.18	-22.21	-22.24	-22.08	-21.59	-22.44	-22.41	-22
47	225	-17.52	-18.37	-21.26	-19.88	-22.64	-22.38	-22.57	-22.38	-21.98	-22.70	-22.64	-22
48	230	-16.37	-16.99	-20.57	-19.75	-22.90	-22.67	-22.87	-22.77	-22.41	-23.03	-22.90	-22
49	235	-15.12	-16.99	-20.41	-16.73	-23.13	-22.83	-23.03	-22.93	-22.60	-23.26	-22.97	-22
50	240	-20.96	-16.90	-17.78	-17.49	-23.29	-22.97	-23.13	-22.90	-22.80	-23.29	-23.03	-22
51	245	-22.08	-22.31	-22.77	-22.77	-23.52	-23.03	-23.23	-22.97	-22.87	-23.33	-23.10	-23
52	250	-23.06	-23.10	-23.39	-22.90	-23.56	-23.00	-23.29	-23.00	-23.00	-23.36	-23.06	-23
53	255	-23.26	-23.23	-23.43	-23.00	-23.59	-23.10	-23.36	-23.06	-23.13	-23.43	-23.16	-23
54	260	-23.33	-23.29	-23.43	-23.03	-23.69	-23.16	-23.39	-23.13	-23.13	-23.43	-23.10	-23
55	265	-23.43	-23.33	-23.39	-23.00	-23.69	-23.16	-23.39	-23.13	-23.39	-23.49	-23.13	-23
56	270	-23.39	-23.29	-23.39	-23.16	-23.69	-23.13	-23.49	-23.16	-23.33	-23.56	-23.23	-23
57	275	-23.36	-23.20	-23.33	-23.29	-23.75	-23.20	-23.46	-23.13	-23.39	-23.56	-23.29	-23
58	280	-23.26	-23.26	-23.26	-23.23	-23.79	-23.23	-23.49	-23.20	-23.59	-23.52	-23.36	-23
59	285	-23.23	-23.26	-23.23	-23.20	-23.69	-23.20	-23.52	-23.33	-23.59	-23.52	-23.29	-23

FIGURE 6-14. *Sample Survey Lines Text File*



NOTE: This matrix had empty cells in the top left corner so we see a lot of '99' values.

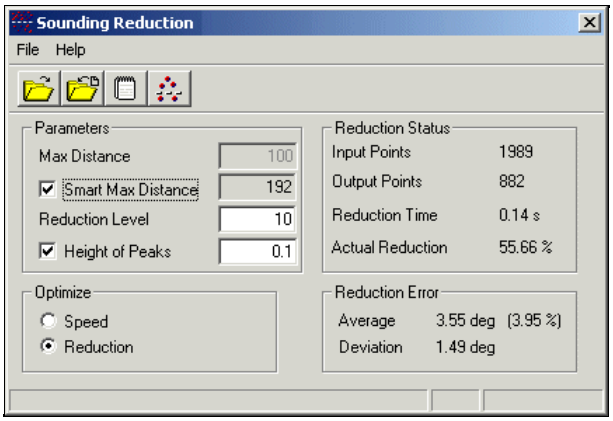
SOUNDING REDUCTION PROGRAM

The SOUNDING REDUCTION program reads your XYZ data file and eliminates points where the surroundings are almost the same based on user-defined criteria. The results are saved in XYZ format, by default, to the project's Sort directory.

SOUNDING REDUCTION PROCEDURE

1. **Select PROCESSING-SOUND SELECTION-SOUNDING REDUCTION.** The Soundings Reduction window will appear.

FIGURE 6-15.



2. **Select FILE-OPEN (or click the icon) and choose the file you wish to reduce** from the file selection dialog that appears. If the Smart Max Distance is checked, the Max Distance in the selected file will be displayed. The number of Input Points will be displayed under Reduction Status.
3. **Enter your Reduction Parameters.**
4. **Click FILE-RUN REDUCTION** (or click the icon). The reduction will be calculated and the related statistics will be displayed on the right-hand side of the screen.

   If you are not satisfied with the resulting statistics, repeat the same steps beginning with selecting FILE-OPEN and changing your parameters until you are satisfied.
5. **Save your Reduced File.** HYPACK® will suggest the name and directory for your reduced file. Select FILE-SAVE or FILE-SAVE AS (or click the icon). The reduced set will be saved and you will return to the main window.

More Information

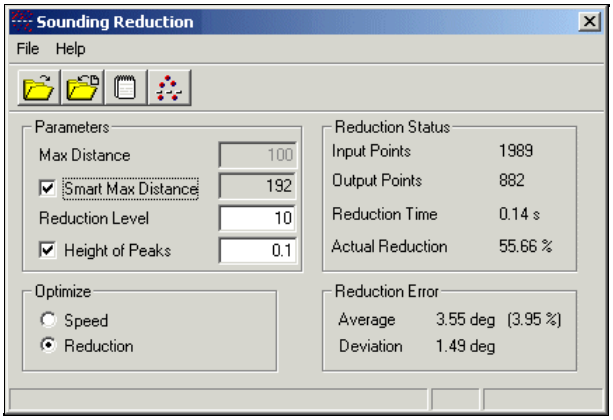
- "Sounding Reduction Parameters" on page 6-122
- "Sounding Reduction Statistics" on page 6-124

SOUNDING REDUCTION PARAMETERS

The program reads the soundings and connects them to each other forming triangular areas (tetrahedrons). You may then define the Maximum Distance you wish to allow between points in your reduced data set and the Maximum allowable angle between these connecting lines.

The larger each of these numbers is, the greater reduction may occur and the fewer small variations in readings will remain in your data set.

FIGURE 6-16. The Reduction Window



On the left-hand side of the window are the parameters that are user-defined criteria for the reduction process.

Max. Distance defines the maximum allowable horizontal distance between points. If you have large flat areas, this value will prevent large empty areas in your data set.

Smart Max. calculates maximum distance based on the selected set of points. It overrides the default Max. Distance value and displays the calculated value for the selected data set.

Reduction Level is maximum allowable angle between the base and vertex. If any of the angles exceed this angle, the point will remain.

Height of Peaks determines the minimum allowable vertical distance between the connected points. If the apex of a tetrahedron is greater than this distance above its base, it will remain in the data set.

NOTE If the apex of a tetrahedron falls outside of the area described by its base, the apex will remain in the data set.

FIGURE 6-17. Apex falls within the area defined by the base

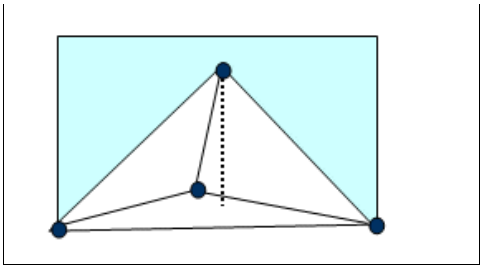
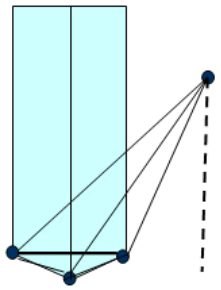


FIGURE 6-18. *Apex falls outside the area defined by the base..*



Optimize Speed or Reduction seems pretty self-explanatory.

SOUNDING REDUCTION STATISTICS

After the reduction has been calculated, the right-hand side of the window displays several statistics about your proposed reduction.

Input Points is the number of points in your original data set.

Output Points is the number of points in your set after the reduction.

Reduction Time is the amount of time the reduction will take.

Actual Reduction is the percentage of points that would be discarded.

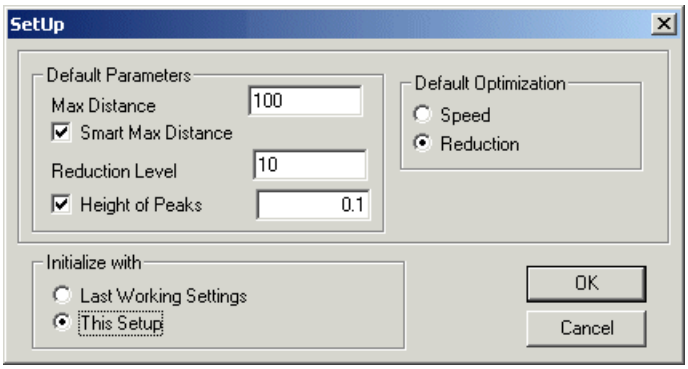
Reduction Error Statistics may tell you something if you're a statistician. Basically, they tell you a little about how much flattening would occur during the process and an approximation of the error introduced. If the statistics are not acceptable, change your parameters.

SOUNDING REDUCTION SETUP

FILE-SETUP enables you to set the default values to be displayed in the Soundings Reduction window. The options are mostly the same as those in the Sounding Reduction dialog.

Initialize With gives you the option to choose **Last Working Settings** or **This Setup.**

FIGURE 6-19. *The Setup Window*



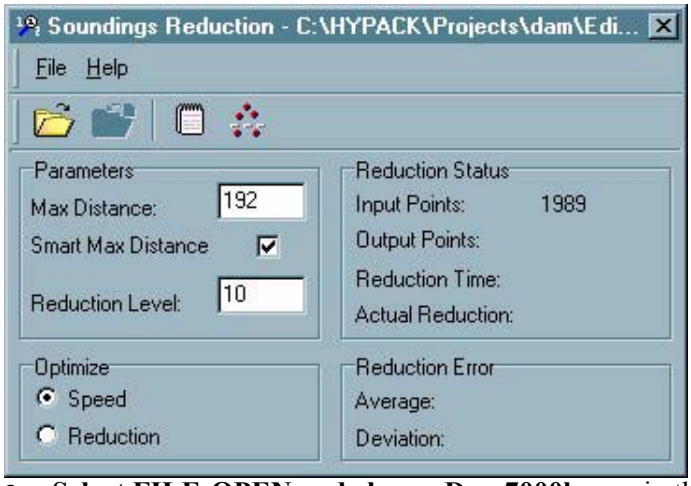
SOUNDING REDUCTION EXAMPLE

Example: Do a sounding reduction on the Dam7000b.xyz file in the \HYPACK\PROJECTS\DAM\EDIT directory. Try the parameters of Maximum Distance = 300 and Reduction Level = 10. Run a second calculation with the parameters of Maximum Distance = 192 and Reduction Level = 20. Save the results of the second calculation to Dam7000b_r.xyz in the same directory.

Solution:

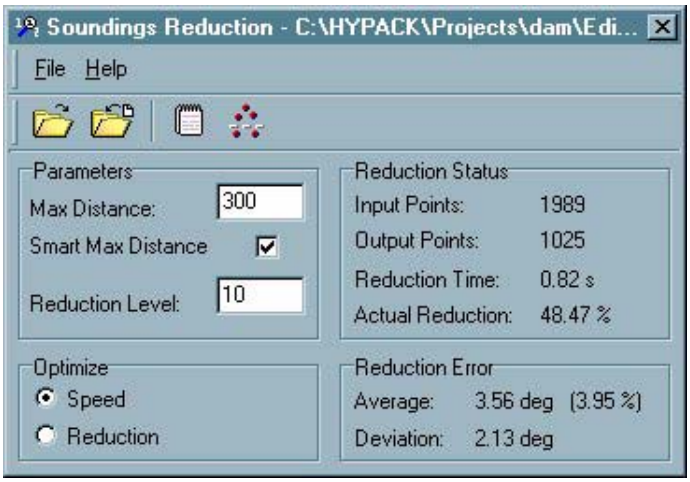
1. **Select PROCESSING-SOUND SELECTION-SOUNDING REDUCTION** from the Main Menu. The Soundings Reduction window will appear.

FIGURE 6-20. *The SOUNDING REDUCTION Window Before the Reduction Calculation*



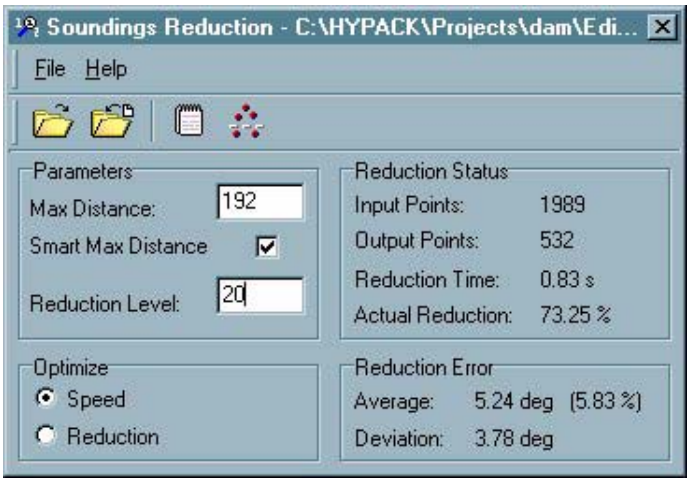
2. **Select FILE-OPEN and choose Dam7000b.xyz**, in the \HYPACK\PROJECTS\DAM\EDIT directory. The number of Input Points =1989 will be displayed under Reduction Status. If Smart Max Distance is selected, the Max. Distance will be 192.
3. **Enter your Reduction Parameters**. Enter Max. Distance = 300 and Reduction Level =10.

FIGURE 6-21. *The SOUNDING REDUCTION Window After the Reduction Calculation*



4. **Click FILE-RUN REDUCTION.** The reduction will be calculated and the related statistics will be displayed on the right-hand side of the screen.

FIGURE 6-22. *The Results of the Second Calculation*



5. **Repeat the same steps** beginning with selecting FILE-OPEN and changing your parameters to Max. Distance=192 and Reduction Level=20.
6. **Save your Reduced File.** HYPACK® will suggest the name Dam7000b_r.xyz and the project's edit directory. Click [Save], the reduced set will be saved and you will return to the main window.

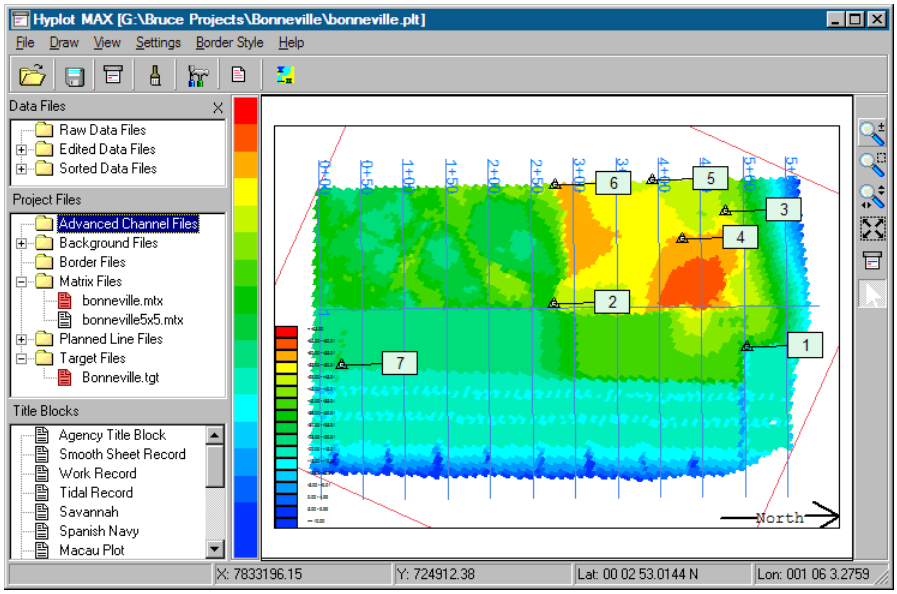
CHAPTER 7

Final Products

HYPLOT

HYPLOT defines the features to be plotted and sends the information to the plotter.

FIGURE 7-1. *HYPLOT Interface*



The HYPLOT interface is much like the HYPACK® window. HYPLOT automatically loads all of the files that are loaded to the project and draws all that are enabled in the HYPACK® area map and within the area defined by your plotting sheet file.. From there, you can draw and erase them from the screen, and define display settings in much the same manner as you do in HYPACK®.

Items that may be included in your plotting sheet, but have no fixed position, such as the North Arrow, imported text and graphics, are initially positioned in your plotting sheet using the appropriate settings dialog. You can easily relocate them by

dragging them with your cursor in the HYPLOT display (or in the control panel).

The finished results can be plotted on any Windows® driven plotter or printer.

RUNNING HYPLOT

The procedure is very simple.

1. **Start the HYPLOT program** by selecting FINAL PRODUCTS-HYPLOT and choosing the project you wish to work on.
2. **Load the Plotting Sheet File** (*.PLT). These files are created in the PLOTTING SHEET EDITOR and define the area to be plotted, the size of your Plotting Sheet and the scale and rotation of your sheet.
   - If you have only one in your project, it will be automatically loaded.
   - If you have more than one, the program will ask which you want to use.

   The HYPLOT screen will appear displaying all of the enabled files in your project. If you have no PLT file in your project, HYPLOT will ask you to create one and close.
3. **Draw all the files you want to plot** in the Plot Design window.
   - **Enable the files you want to plot** by right-clicking on the file name in the lists at the left and selecting Enable.

     When non-binary data files are enabled in a project, you can choose to:
     - draw the soundings
     - draw the track lines
     - draw both soundings and track lines to the area map.

     Make your choice by right-clicking on the data folder and selecting ‘Enable Soundings’ or ‘Enable Track lines’ (or both).

     NOTE: Track lines can not be displayed for XYZ files as there is no track line information available in this format.

   - **Remove any files you do not wish to plot** by right clicking on the file name in the lists at the left and deselecting ‘Enable’.
   - **To disable all project or data files of a selected type**, select the folder in the Files list then select DRAW DISABLE FILES from the menu.
4. **Define your display settings through the Control Panel.** Each type of file has a corresponding tab in the Control Panel where you can choose how they will be displayed.

NOTE Don't be too worried about positioning features such as added text, title blocks, the north arrow, etc. You can use the cursor to drag them to the exact position with your cursor when you return to HYPLOT.

5. **Save your settings.** (Optional) Select FILE-SAVE and name your file. All of the settings will be saved to the PLT file and can be reloaded at a later time by selecting FILE-LOAD and selecting the PLT file.
6. **Choose your plotting method.** Select FILE-PRINT and select to plot a composite of raster and vector drawings or plot pure vector data directly. When you click [OK], the Windows® Page Setup dialog automatically appears.
7. **Enter your Page Setup information and print**. (This can also be accessed by selecting FILE-PAGE SETUP.)
8. **Send the data to the printer or plotter** by selecting FILE-PLOT and selecting your printer or plotter settings and clicking [OK].

More Information

- "Setting Display Options in HYPLOT" on page 7-3
- "Plotting Methods in HYPLOT" on page 7-30
- "Exporting your Plotting Sheet to DXF Format" on page 7-32

SETTING DISPLAY OPTIONS IN HYPLOT

The Draw and View menus, as well as the Icon Bar (top) and Screen Control Bar (right) of HYPLOT provide many of the standard controls for:

- Adjusting the HYPLOT screen view
- Designating the display of certain features in the plot itself
- Saving and printing your plotting sheet

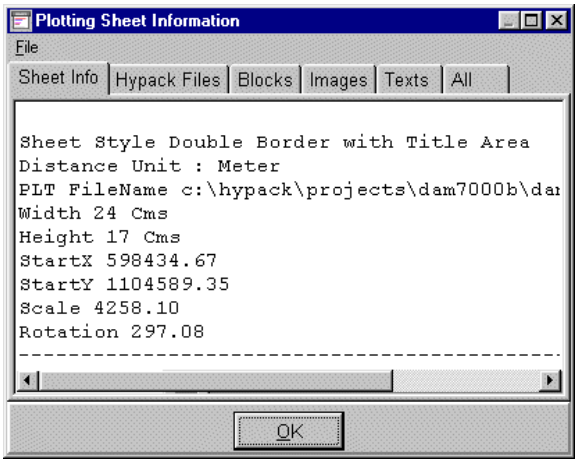
The **Control Panel** (F9) defines your plotting settings for each type of file. Select a feature from the tree view of categories on the left and the related display options will be available for viewing and modification on the right. At any time, you can set the current settings, for all feature types, as your default by clicking **[Save as Default].** If you then make changes and want to reload the default settings, you can easily return to those settings by clicking **[Restore Default].**

Plotting Sheet Information is a series of text files listing the current settings from the Control Panel. Each tab can be printed or saved to a text file.

The **Plotting Sheet Information icon** accesses a tabbed report form which displays the Control Panel settings in textual form.

Each tab displays information on a particular type of input to your plotting sheet including:

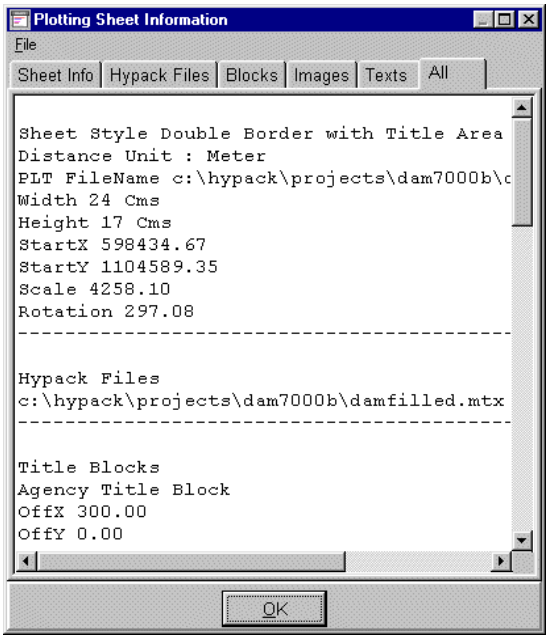
FIGURE 7-2. *Plotting Sheet Information—Sheet Info Tab*



The All Tab combines all the data from the other tabs into one, thus you can focus on only 1 feature or the entire sheet.

From this dialog, you can print the information on the default printer for your computer.

FIGURE 7-3. *Plotting Sheet Information—All Tab*



The **Border Style** drop-down menu enables easy border selection for your plot.

Define Sounding Colors by selecting SETTINGS-SOUNDING COLORS and using the standard Colors dialog.

Define the DIB Bit Resolution by selecting SETTINGS-OTHER-DIB RESOLUTION. This value defaults to 16 bits, but you can alternatively set it to 8 or 24. A higher bit count provides higher resolution to your plot but it also takes more memory. If you have a large background file and limited memory on your hard drive, this may help you out.

More Information

- "Sounding Color Settings in HYPACK®" on page 1-34

BORDER OPTIONS IN HYPLOT

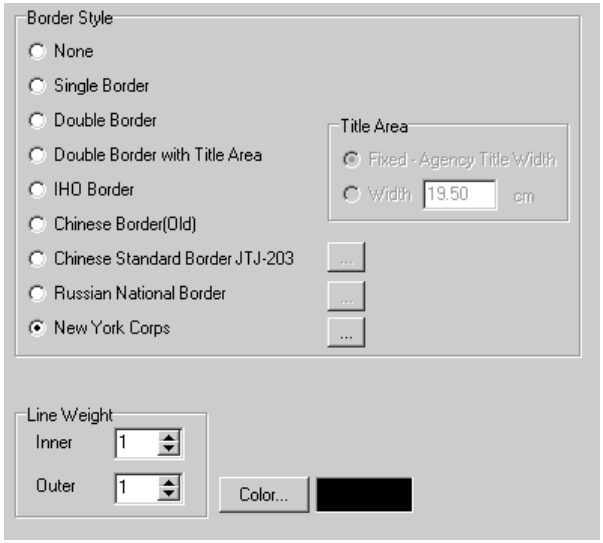
The Borders Tab in the Control Panel describes the border of your plot. Select the **Border Style** from the list. The **Line Weight** can be set for the generic styles by typing the number of pixels in the Inner and Outer fields. Set the color by clicking **[Color]** and selecting the one you want from the colors dialog.

If you select the "Double Line with Title Area" option, the Title Area options are enabled.

- **Fixed** sets the width of the title area to fit the Agency Title Block.
- **Width** creates a title area with user-defined width.

These options are not available for the IHO border style.

FIGURE 7-4. *Border Display Settings in HYPLOT*



The Chinese Standard border and the Russian National border have additional display options which are accessed by clicking the corresponding button ([…]).

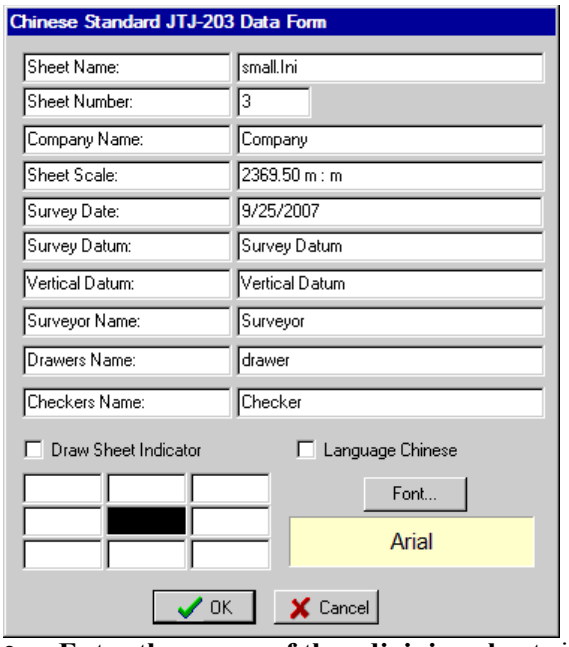
Both the Russian, Chinese and New York standard options define several labels that appear at pre-determined places outside the border.

The **Chinese Standard** includes a Sheet Indicator--a diagram where your current plot is in the center. The additional fields surrounding it represent additional plots of adjacent areas. This diagram can be included on your current plotting sheet to indicate the adjoining sheets.

To plot the Sheet Indicator:

1. Click the […] corresponding to the Chinese Standard border.
2. Check the Draw Sheet Indicator option. The Chinese Standard Data Form will appear.

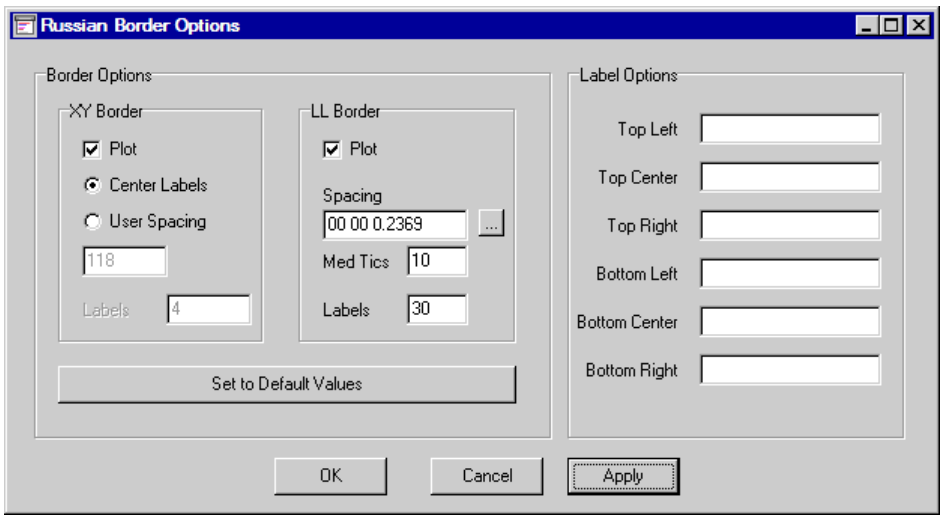
FIGURE 7-5. *Chinese Standard Border Options*



3. **Enter the names of the adjoining charts** in the fields surrounding the solid square and click [OK].

The Russian border options provide some alternative grid labeling choices.

FIGURE 7-6. Russian Border Options



XY Border

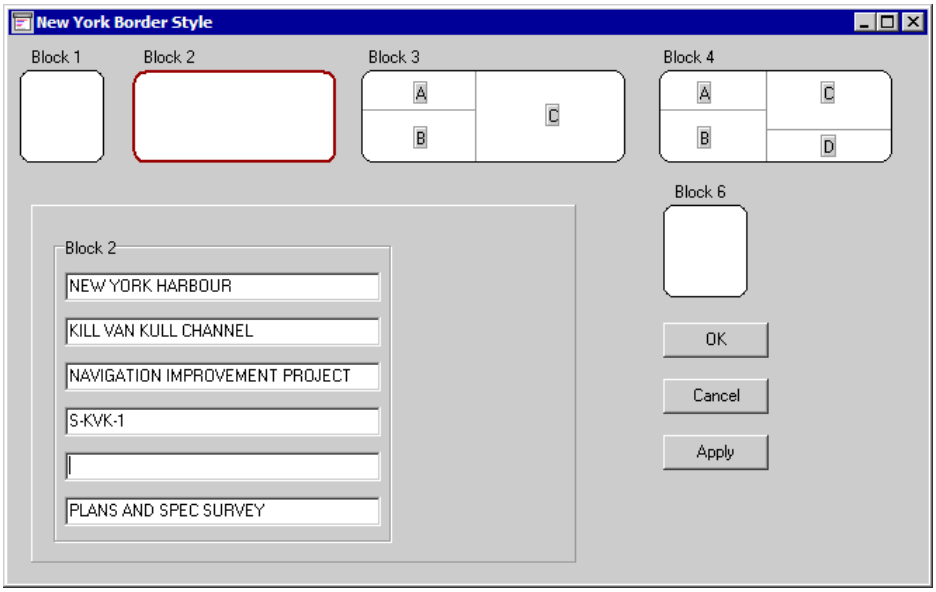
- **Center Labels:** The center of each side is marked and labeled.
- **User Spacing**: Intervals, in survey units, marked outside the inner border.
- **Labels**: Tic intervals where labels appear. For example, enter a 10 and every 10^{th} tic will be larger and labeled.

Lat/Lon. Border Options:

- **Spacing**: Distance in degrees, of the ticks marking the outside of the border.
- **Medium Tics**: Intervals of these ticks can be marked with medium-sized marks for easy reading. For example, enter a 5 and every 5th tic will be larger.
- **Labels**: Tic intervals where labels appear on large tics. For example, enter a 10 and every 10th tic will be larger and labeled.

The **New York** standard includes a series of custom title blocks that fit side-by-side along the right side of your plot.

FIGURE 7-7. *New York Standard Border Options*



Each block is represented by a diagram in the dialog.

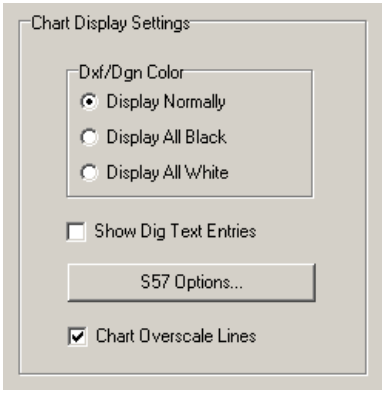
To enter your content:

1. **For each block, do the following**:
   a. **Click the diagram of the block**. Its border will be highlighted and the data entry fields for the selected block will appear.
   b. **Enter your project information** in the fields provided.
2. **When you have defined each block, click [OK]**.

CHART OPTIONS IN HYPLOT

The Charts Tab offers display options that pertain to DXF, DGN and DIG charts.

FIGURE 7-8. *Chart Display Settings in HYPLOT*



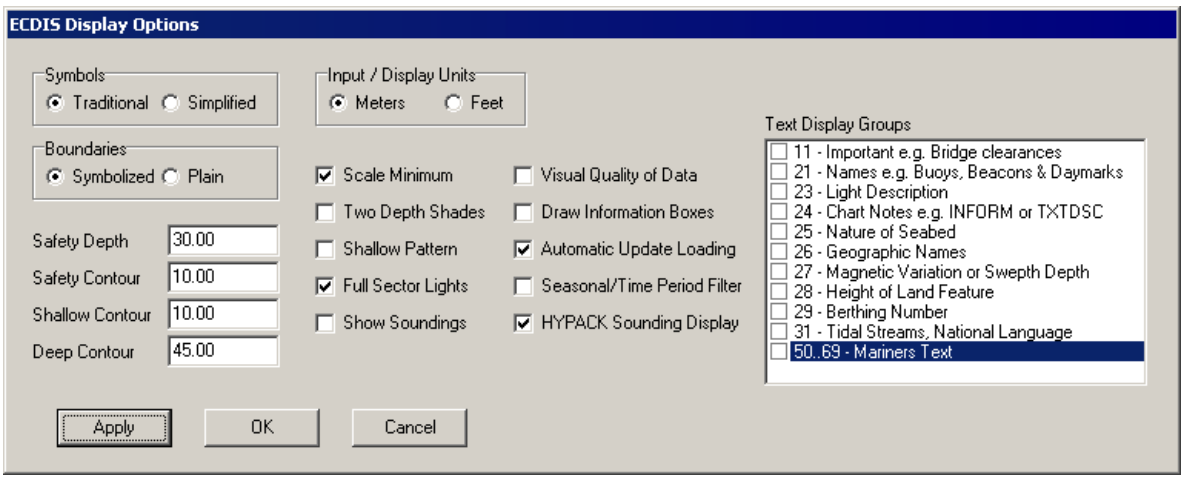
DXF/DGN Color options allow you to optimize its display against other background files.

- **Display Normal** draws the file using whatever colors are stored in the file. (It can't draw color contours unless it was created with color!)
- **Display All Black** and **Display All White** enable you to draw them in whichever color is best in your circumstance. If you have a dark TIF file, a white overlay would display best. If you have an S57 chart, a black DXF might be more appropriate.

Show Dig Text Entries: If you are plotting a DIG file, you can choose to include or exclude the object labels.

[S57 Options] in the displays the ECDIS Display Options dialog.

FIGURE 7-9. *S57 Options Dialog*



Symbols: Choose between Traditional and Simplified.

Boundaries: Choose to have them marked with symbols (Symbolized) or as plain lines (Plain).

Safety Depth displays depth labels in different colors above and below this depth.

Safety Contour, Shallow Contour and **Deep Contour** define different depth ranges which will be displayed with backgrounds of different shades of blue. Note: This option is overridden by the Two Depth Shades option.

Input/Display Units: The units of measure in which your depths will be displayed. It is also the unit in which you will work while in the ENC EDITOR. (You will enter chart soundings and all measurements in the selected units.)

NOTE: In the ENC EDITOR, sounding files imported to your chart are assumed to be in the units defined in your geodetic parameters. They are converted to the units indicated in your chart information and displayed according the units set in the S57 display options.

Scale Minimum displays different map features and symbols at varying zoom scales according to S57 standards. This option prevents your Map window from becoming overly cluttered. If this option is clear, everything will be displayed regardless of the zoom scale.

Two Depth Shades uses only two shades to display depths greater than and less than the Safety Contour.

Shallow Pattern draws a pattern in the areas of the map where the depth is shoaler than the safety contour.

Full Sector Lights includes data regarding direction and color of lights. If this is off, you will see only the position of the light source.

Show Soundings toggles the display of chart soundings.

Visual Quality of Data: S57 charts include markings that indicate whether the chart has been tested for accuracy and, if so, how accurate it is. Check this option to clear this 'clutter' from your display.

Draw Information Boxes: Draws S57 markers at all points of interest. Clearing this option will provide a less cluttered display.

Automatic Update Loading: When you load a base chart (typically *.000) and there are update charts (typically *.001, *.002…) in the same folder, checking this option loads all related chart information to provide the most updated display.

Seasonal/Time Period Filter: Object attributes may specify time ranges when they would be most applicable to display. Check this option to display only objects whose attributes match the current time.

HYPACK® Soundings Display: When 'Show Soundings' is checked, this option toggles between ECDIS display and HYPACK® display options.

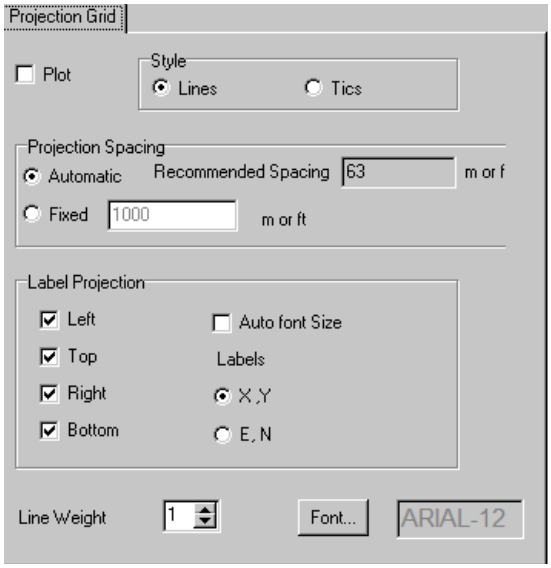
Text Display Groups: Charts can get cluttered with excessive text. Select only those text features you want to see in your chart display.

GRID OPTIONS IN HYPLOT

The Grid Tabs define the format for labeling both the lines and tics. You can choose to plot the projection grid or Lat/Long (or both) and set different display settings for each.

PROJECTION GRIDS

FIGURE 7-10. *Grid Display Settings in HYPLOT*



Plot determines whether you want to plot the XY grid.

Given that, the rest of the settings describe how it will appear.

Style is a choice of drawing the lines or tics at the user-specified spacing.

Projection Spacing determines the distance between grid lines or tics.

- **Automatic Spacing** adjusts according to the zoom factor to provide a useful display.
- **Fixed Spacing** keeps the grid markings at the constant distance defined in the corresponding field.

Label Projection selects which sides of the plotting sheet will display grid labels.

We find that Left and Bottom works well.

Auto font Size automatically sizes the labels to fit the number of grid lines specified. The labels will be as large as possible and still fit side by side on your plotting sheet.

Labels can display as **X,Y** or **E, N.**

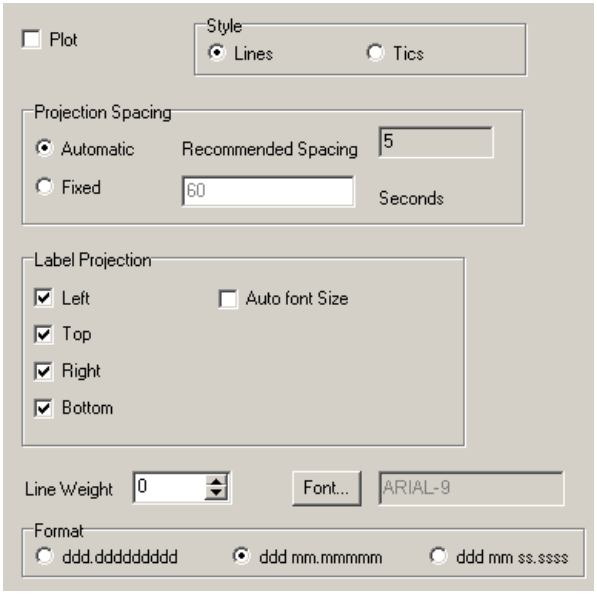
Line Weight sets the thickness of the lines or tics.

[Font] displays the standard Windows® Font dialog for you to adjust the appearance of the grids and grid labels. Sample results of each change can be viewed in the area below each set of buttons.

LAT./LON. GRIDS

HYPLOT enables you to display WGS-84 or Local Lat./Lon.. Their setup tabs are identical.

FIGURE 7-11. *Grid Display Settings in HYPLOT*



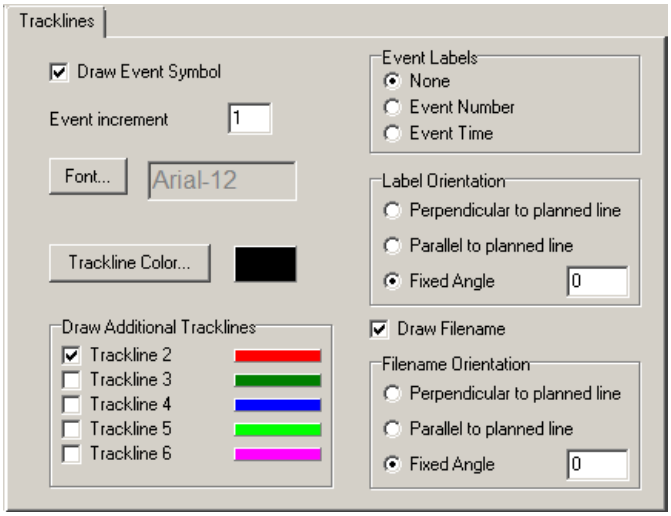
Lat/Lon. Grid settings are the same as Projection Grid settings, but the Format option replaces the Labels option.

Format defines how the Lat./Lon. positions are expressed.

TRACK LINE OPTIONS IN HYPLOT

The Track Lines Tab affects the drawing and labeling of events and track lines. You can toggle the display of track lines to the screen by right clicking the data file folder in the list at the upper left and selecting Enable Track Lines.

FIGURE 7-12. *Track Line Options in HYPLOT*



Draw Event Symbol draws a circle at each event location with the user-defined label. You can choose to label your track lines with the Event

Numbers or the Time of the soundings. You may label every event (Label Increment=1) or at even intervals by entering an integer greater than one.

Event Increment defines how often the event marks will be labeled. An increment of 1 means every event mark is labeled. An increment of 5 means every 5th event mark is labeled.

Event Labels tells the program whether to label with Event Number or Event Time.

Label Orientation sets the angle at which event labels will be drawn. Elect to label events Perpendicular or Parallel to the planned line, or define another angle. **Fixed Angle** is the angle the text is drawn relative to the map window. (It is unrelated to the map orientation.)

[Font] is used to determine the color and font of the event labels.

Draw File Name enables you to label the track lines with its file name.

File Name Orientation affects track line labels in the same manner as the Label Orientation affects the event labels.

Draw Additional Track Lines enables drawing the track lines of up to 6 vessels (positioning systems) to the screen. We all know that towfish don't follow the same track of the vessel towing it. Now you can see both track lines accurately displayed. Track line 1 will always belong to the vessel designated as the main vessel in Survey.

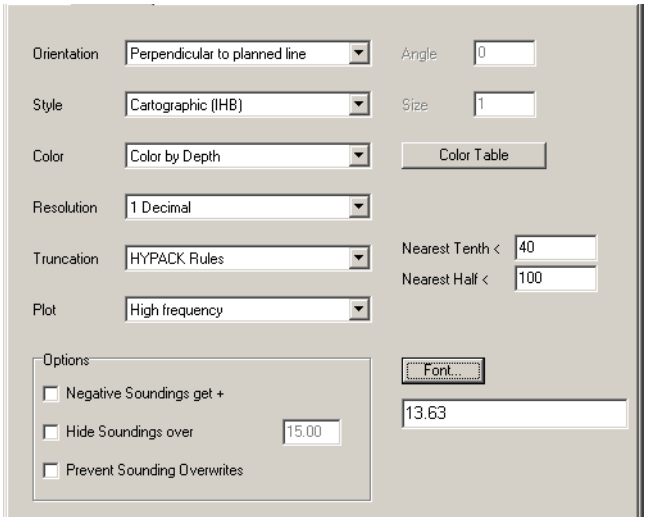
More Information

- "Specifying the Main Vessel in Survey" on page 3-34

SOUNDINGS IN HYPLOT

The Soundings Tab enables you to set how the soundings are presented and plotted. You can toggle the display of the soundings by right-clicking the data file folder and selecting 'Enable Soundings'.

FIGURE 7-13. *The Soundings Tab*



Orientation draws XYZ data at a user-specified angle relative to the first LNW file listed in the project files list. Elect to plot soundings:

- **Perpendicular to the planned line**,
- **Parallel to the planned line**
- At a user-defined **Fixed Angle.** This is the angle the text is drawn relative to the map window. (It is unrelated to the map orientation.) Any angle from -360 to +360 is permissible

Style: Choose the format with which to write your sounding.

- **Decimal Point on the Mark (USACE)** option places the decimal point at the location of the sounding and writes a normal size fraction.
- **Cartographic (IHO)** centers the integer portion of the sounding at the sounding location and then writes a smaller, lower fraction.
- **Spanish Navy (IHM)** places the decimal point at the location of the sounding and then writes a smaller, lower fraction.
- **Pixel:** represent the location of each sounding with a color-coded Pixel (dot) of a user-defined size.
- **Russian:** The sounding location is marked with a dot with the sounding value from the TIN MODEL Input file to its right. If you have a second TIN model, the depth from the Additional file appears left of the sounding position.

Color is another place to define sounding color settings for loaded data files. You can draw soundings:

- **All in black** .
- **Color by Depth:** The accompanying button accesses the standard HYPACK® Color Settings dialog if you want to modify the depth colors.
- **ECDIS**
- **Color By File** allows you to set specific colors for each catalog or individual file.

- **Use Seabed ID:** If you load an XYZid file to TIN MODEL, where the 'id' is the seabed identification number, the program can output a matrix file based on the seabed ID instead of the depth. This enables you to display your data by seabed classification in the HYPACK® Map.

  These changes only affect this session of HYPLOT.

  When the Color by Depth option is selected, **[Color Table]** enables you to change the color palette for your soundings *without affecting your project colors*.

Resolution enables you to specify soundings to either one 1 Decimal (Tenths) resolution or 2 Decimal (Hundredths) resolution.

Truncation enables you to determine how the soundings are presented.

- **None** displays the soundings decimal places according to the resolution setting.
- **Truncate to Tenth** just leaves off the hundredth digit. For example, 6.97 is written as 6.9.
- **ROK Rules** and **HYPACK® Rules** use Republic of Korea and International Hydrographic Organization rounding rules respectively to present the soundings. If either of these last two options is selected, you must specify the depth level at which soundings are presented rounded to the nearest tenth and to the nearest half.

  For example, where Nearest Tenth=40 and Nearest Half=100, soundings below 40 meters are written to the tenth. Soundings from 40 to 100 are written to the half and soundings above 100 are written to the meter.

The **Options** settings contain the following items:

- **Negative Soundings get "+"** does just that. If you have processed your sounding data in elevation mode (z values are negative), this setting will display them on the screen in depth mode (z values are positive).
- **Hide Soundings Over** a user-defined level plots only soundings up to the specified depth.
- **Prevent Sounding Overwrites** plots soundings gridded with sufficient spacing to make them readable. To accomplish this, the number of soundings displayed in a given area changes with the zoom range. This is *for display purposes only. It does not thin your data*.

The **Plot Depth options** are used to tell the plotting program which depth to present**.**

- **Plot High Frequency** plots depth 1.
- **Plot Low Frequency** plots depth 2.
- **Plot Difference** plots Depth 2-Depth 1. This may provide a general idea of the thickness of bottom material.

[Font] displays the Windows® font dialog for the sounding display.

MATRIX OPTIONS IN HYPLOT

The Matrix Tab enables you to choose to plot your Matrix border, the depths (if it is a filled matrix) or both.

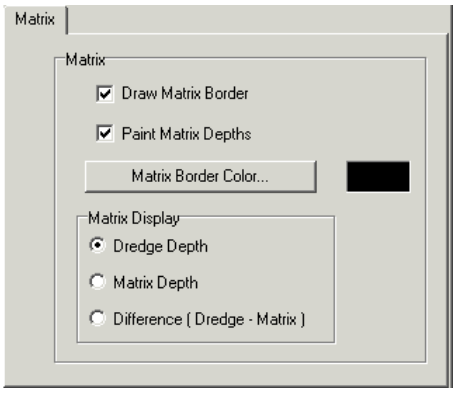
Paint Matrix Depths toggles the matrix depth data on and off.

The **[Matrix Border Color]** displays a color selection dialog to customize the color of the Matrix Border.

Matrix Display: HYSWEEP® matrix files contain two depths for each matrix cell: the Predredge Survey or Matrix Depth and the Dredge Depth. The Matrix Display options allow you to plot either depth value or the difference between them (Dredge Depth – Matrix Depth).

NOTE: If you have a HYPACK® Matrix File, select Matrix Depth. The Dredge Depth and Difference options will display an empty matrix.

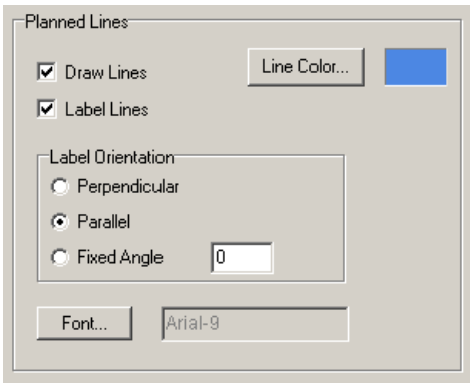
FIGURE 7-14. *Matrix Options in HYPLOT*



PLANNED LINE OPTIONS IN HYPLOT

The Planned Lines tab contains display settings for any survey lines that you plot.

FIGURE 7-15. *Planned Line Settings in HYPLOT*



Draw Lines includes your Planned Line file in the plotting sheet.

Label Lines places the line name at the start of each line in the plotting sheet.

Label Orientation rotates the label relative to the planned line. It can be **Perpendicular, Parallel** or set at a user-defined **Fixed Angle**.

[Font] displays the Windows® font dialog to designate the size and color of the line labels. HYPLOT supports only true type fonts.

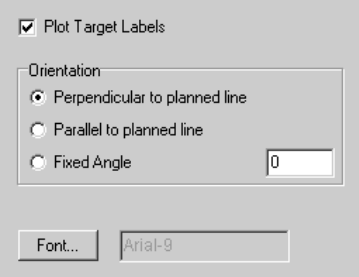
[Line Color]: Click the button to select a new color from a colors dialog. The current color is displayed in the color box.

To modify the line color, click [Line Color] and select the color from the color selection dialog.

TARGET OPTIONS IN HYPLOT

The Targets dialog in the Control Panel provides choices about plotting Target Labels.

FIGURE 7-16. *Target Options in HYPLOT*



If you choose to plot them, set the color and font using the [Font] button. The Targets themselves are black.

Orientation sets the angle at which target labels will be drawn when the circle target display is selected. Elect to label targets Perpendicular or Parallel to the planned line, or to define another angle. **Fixed Angle** is the angle the text is drawn relative to the map window. (It is unrelated to the map orientation.)

TITLE BLOCKS IN HYPLOT

The Title Block Tab enables you to select one or more Title Blocks to plot. You can plot without a Title Block or you can plot with one or more blocks. Several Title Block templates are included in the Hypack_2011\Templates\Hyplot Title Blocks folder.

Think of a title block as a rectangular container with one or more rectangular elements within. The title block and each of its elements is drawn according to the properties which you will set in the area on the right-hand side of the editor. You can change the content; the number, arrangement and appearance of the elements and the display of the 'container' block.

To add a title block to your plotting sheet, you can:

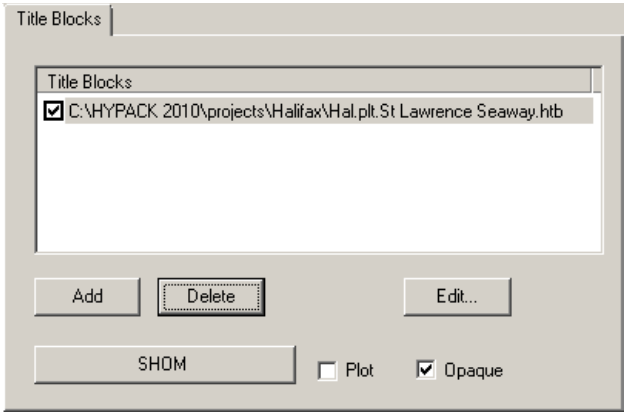
- Load an existing title block and modify it for your current plotting sheet if necessary.
- Build a custom title block.

Loading a Title Block Template

To load a title block to your plot:

1. **Open the HYPLOT Control Panel**.
2. **Select the 'Title Blocks' item in the list on the left.** The Title Blocks options will appear on the right.

FIGURE 7-17. *Title Block Options in HYPLOT*



3. **Click [Add]**
4. **Select the title block you want and click [Open].** You can select a template from the Hypack_2011\Templates\Hyplot Title Blocks folder, or another existing title block. If you choose a title block outside of the project, HYPLOT will make a local copy of the selected title block, renaming it by appending the project name to the beginning of the title block file name. The new file will then appear in the list in the Title Blocks dialog.
5. **Plot one or more title blocks listed** by checking only the boxes for the blocks you want to print.
6. **Click [OK]** to return to the HYPLOT screen.

Loading the SHOM Title Block:

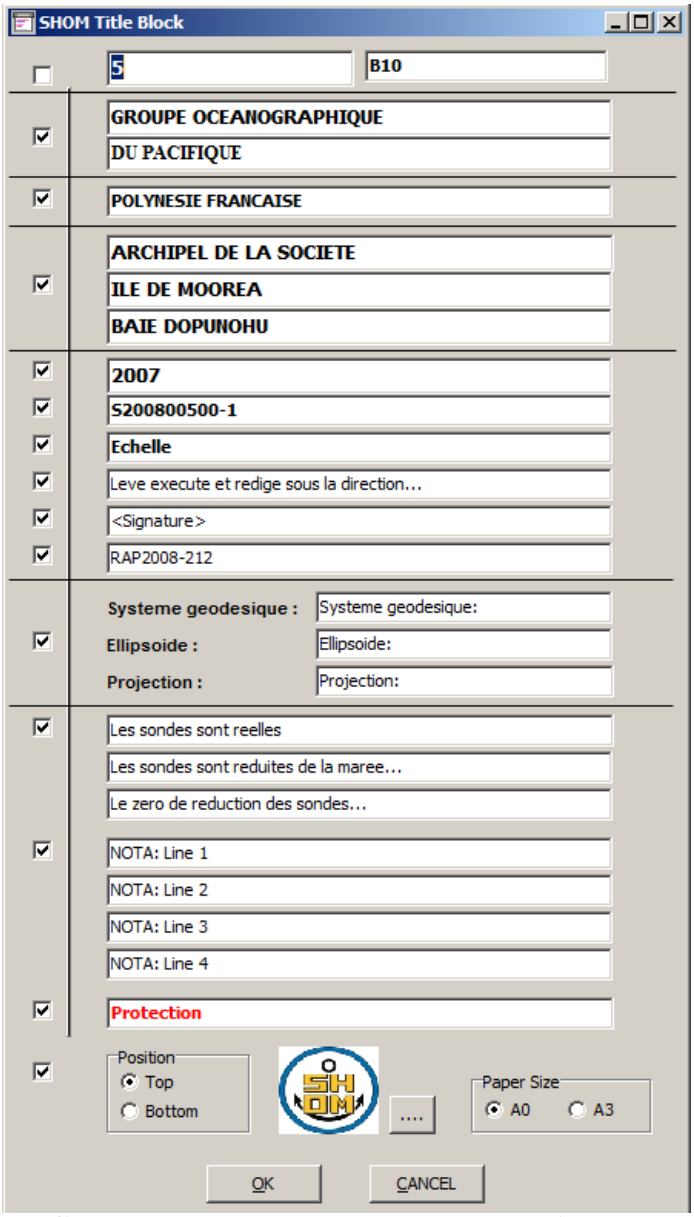
The SHOM title block has more complex set of requirements. Therefore, it has its own routine for loading and editing it for your plotting sheet.

NOTE: To display the SHOM title block, you must also select the 'Double Border with Title Area' border option.

To include a SHOM title block in your plotting sheet:

1. **Check the 'Plot' checkbox**.
2. **Click [SHOM]** and the SHOM template will appear.

FIGURE 7-18. *SHOM Title Block Editor*



3. **Check the check boxes to select each section you want to write** in your title box.
4. **Modify the text in all selected fields to make them correct** for your current plotting sheet.
5. **Choose whether the selected fields draw at the top or bottom of the title area**.
6. **Load the correct logo** by clicking the [...] and browsing for the correct image file.
7. **Set the Paper Size** to A0 or A3.
8. **When you are satisfied, click [OK]** to return to the Control Panel.

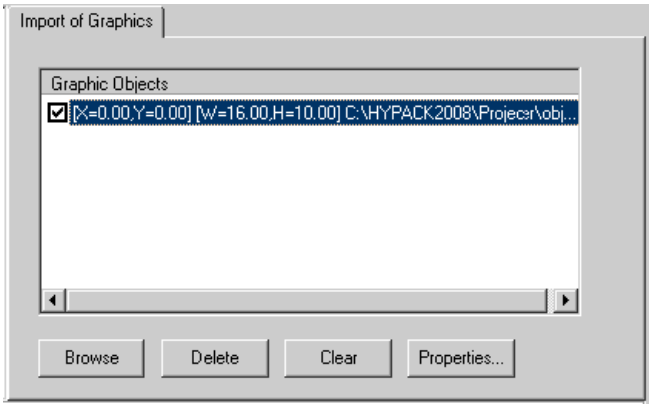
More Information

- "Creating a Custom Title Block Title Block Editor" on page 7-26
- "Border Options in HYPLOT" on page 7-5

IMPORT OF GRAPHICS IN HYPLOT

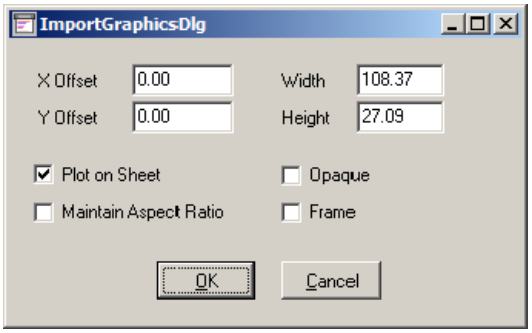
The Import of Graphics tab enables you to import image files to your plots. This enables you to include your company logo, a plotting sheet layout graphic or any other graphic in your plot.

FIGURE 7-19. *Importing a Graphic File to HYPLOT*



1. **Load one or more graphic files**. For each image, click [Browse] and choose your graphic using the file selection dialog.
2. **Set your graphic properties**. There are two methods.
   - **To set graphic properties through a dialog**, highlight the graphic you want to modify and click [Properties]. The Import Graphics dialog will appear.

FIGURE 7-20. *Import Graphics Dialog*



   - **X and Y Offsets** set its position relative to the lower left corner of the plot.
   - **Plot on Sheet** is an additional place where you can tell HYPLOT to include this image. It stays synchronized with the check boxes in the Import of Graphics dialog.

- **Maintain Aspect Ratio** forces the image to retain its vertical to horizontal proportions when you change either the **Height** or **Width**. Otherwise, you can change **Height** and **Width** independently of each other and the image will stretch to fit.
- If you check the '**Opaque**' box, the image will cover any data it overlays. Otherwise, it will be transparent and you can see data that may be plotted behind it.
- Check **Frame** to draw a narrow black outline around the image.

- **To set graphic properties with your mouse**:
  - **Position the graphic** by clicking anywhere inside the graphic display in your plotting sheet and drag it to its new position.
  - **Resize the graphic** by selecting the graphic then clicking and dragging the handles any of its sides.
  - **Set the graphic to plot** by checking its checkbox in the Import Graphics tab.

Delete an entry by selecting the File Name and clicking [Delete].

Delete all of your entries by clicking [Clear].

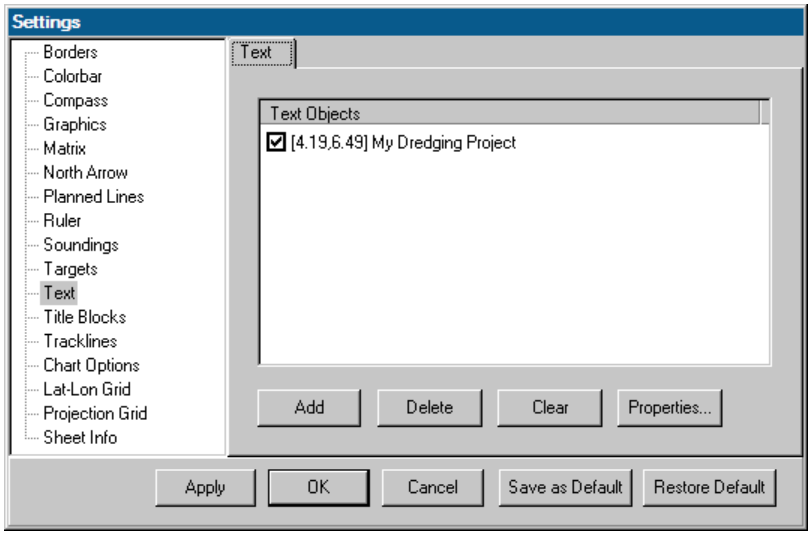
More Information

- "Generating Plotting Sheet Layout Graphics" on page 2-281

TEXT OPTIONS IN HYPLOT

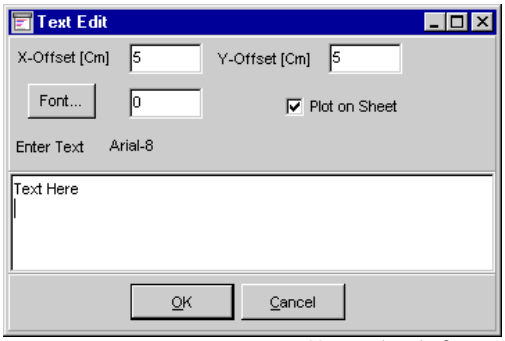
You can insert text other than the labels to your plot. Do this through the text settings in the Control Panel.

FIGURE 7-21. *Text Tab*



1. **Click in the Text column and then on [Add].** The Insert Text dialog will appear.

FIGURE 7-22. *Text Insert dialog*



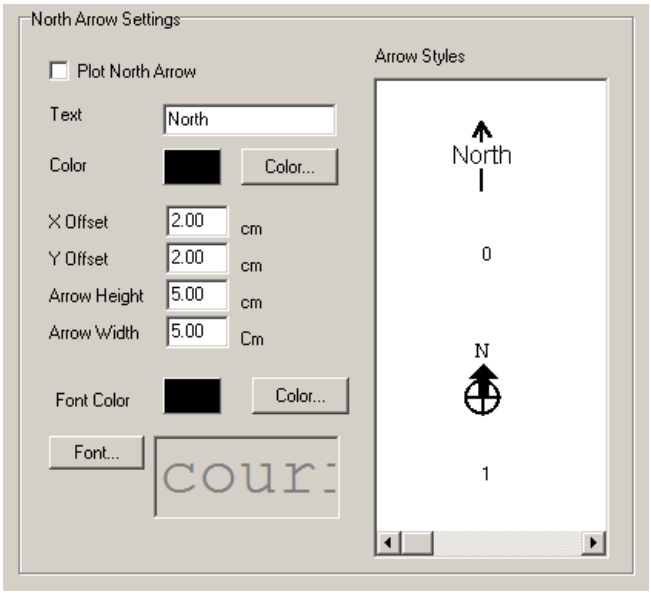
2. **Enter the X and Y offsets** (cm) from the bottom left corner of the plotting sheet to the point where the text will begin.
3. **Set the font** using [Font] and the standard Windows® font dialog.
4. **Enter the text you want to appear** under Enter Text.
5. **Click [OK]**.

NOTE: You can later edit your text by selecting it in the Text Tab and clicking [Properties]. The Text Edit dialog will appear with the data corresponding to the selected text loaded. Make your changes and click [OK].

NORTH ARROW OPTIONS IN HYPLOT

To plot a North Arrow select DRAW-NORTH ARROW in the HYPLOT menu or check **Plot North Arrow** in the North Arrow Tab. Display settings for the North Arrow symbol include:

FIGURE 7-23. *North Arrow Tab*



Arrow Styles provides a selection of North Arrow styles. Scroll through the options and click on your choice.

Text labels the arrow . If you choose the first arrow style, you can Edit the text that bisects the arrow. If no text is entered, a solid arrow will be drawn.

Color affects the color of the arrow symbol.

Offset X and **Offset Y** positions the arrow on your plotting sheet where settings of zero indicate the lower left corner.

Arrow Height and Arrow Width are the vertical and horizontal measurements of the arrow.

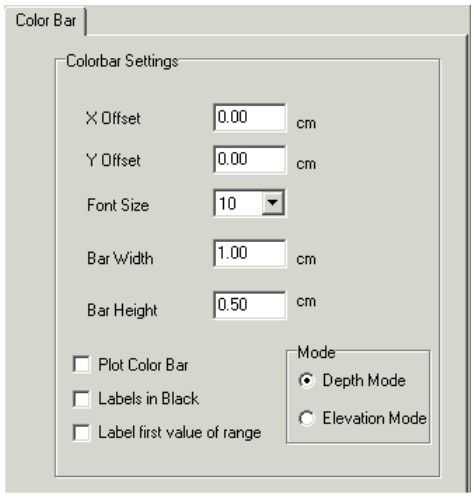
Font Color and **[Font…]** affect the text only.

COLOR BAR OPTIONS IN HYPLOT

To plot a legend of the colors and corresponding depths:

- **Select DRAW-COLOR BAR** from the HYPLOT menu or
- **Check Plot Color Bar** in the Color Bar Tab and define the settings for its position and size.

FIGURE 7-24. *The Color Bar Tab*



X Offset and **Y Offset** designate the position for the lower left corner of the color bar.

Size enables you to adjust the size of the labels.

Bar Width and **Bar Height** defines the size of each color in the color bar.

Plot Color Bar toggles the Color Bar display on and off.

Labels in Black prints the color bar ranges in black. If this is cleared, they will be printed in colors matching the color of the range they describe.

Label first value of range prints only the upper depth of each color range.

Mode: By HYPACK® convention, positive depths are downward in depth mode and upward in elevation mode. In HYPLOT all depth values are positive. Selecting Elevation Mode places the larger value at the top of the color bar display. (Greater value indicates greater height.) Depth Mode places the larger value at the bottom.

COMPASS OPTIONS IN HYPLOT

You can include a compass on your plot using the settings in the Compass Tab.

FIGURE 7-25. *Compass*

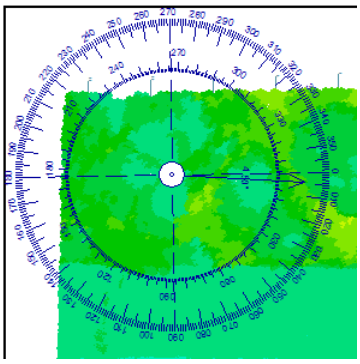
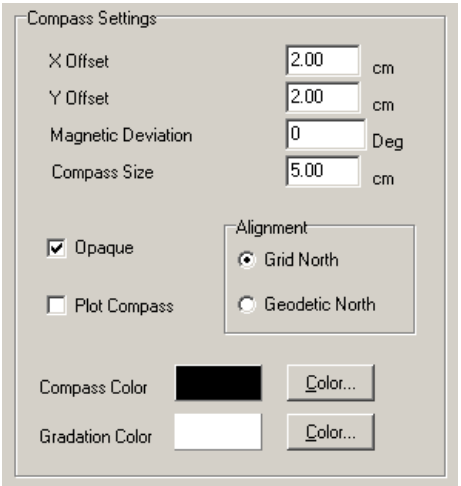


FIGURE 7-26. *The Compass Tab*



Center X Offset and **Center Y Offset** determines the position of the compass center on the plot.

Magnetic Deviation enables you rotate the compass by a user-defined amount to show the difference between the direction to Geodetic North and Magnetic North.

Compass Size sets the diameter of the plotted compass.

Check **Opaque** to draw a solid white background behind the compass. If this is not selected, other plotted objects will be visible through the compass.

Plot Compass instructs HYPLOT to draw the compass according to these settings. If you prefer to omit this feature from your plot, deselect this option.

Alignment deternes whether the compass will be pointing to Grid North or Geodetic (True) North.

Compass Color is the background color when the compass is opaque.

Gradation Color is the color of the markings and numbers on the compass.

You can set each color by using the coordinating [Color] and selecting your color from the dialog.

RULER OPTIONS IN HYPLOT

You can plot a ruler to show the scale of your drawing.

FIGURE 7-27. *A Sample Scale Ruler*

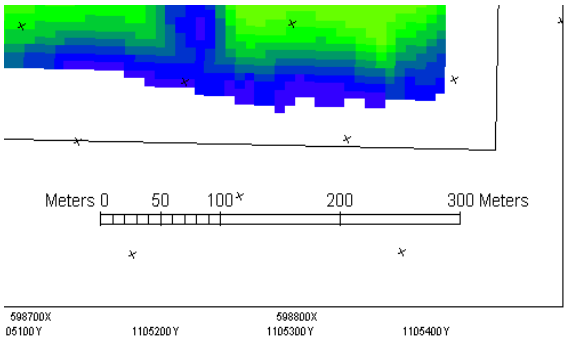
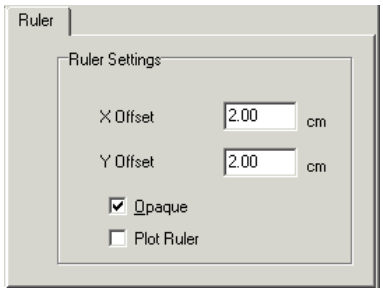


FIGURE 7-28. *The Ruler Tab*



X Offset and **Y Offset** position the left end of the scale.

Opaque draws it with a white background.

Plot Ruler tells whether the ruler will be drawn.

PLOTTING SHEET INFORMATION IN HYPLOT

The **Date, Time and Plotting Sheet Number** can be included in your plot.

Date Time Format provides a selection of formats for the presentation of the date and time that the sheet is plotted.

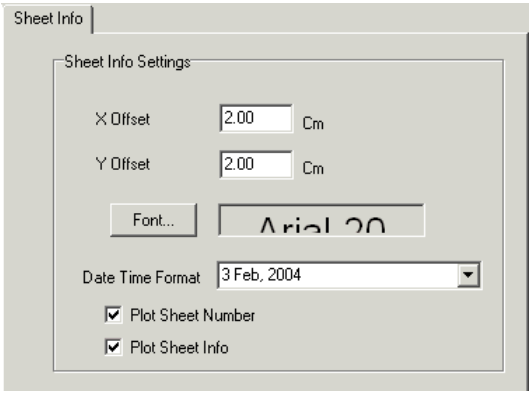
X and Y Offsets can be used to position the text on your plotting sheet where settings of 0,0 begins the line in the lower left corner.

[Font] displays the Windows® Font dialog to set the type.

Plot Sheet Number begins at "1" when you initially open a PLT file and it is automatically incremented each time you print it. Check this option to append the plotting sheet number to the end of the Date Time string.

The **Plot Sheet Info** option toggles the display on and off.

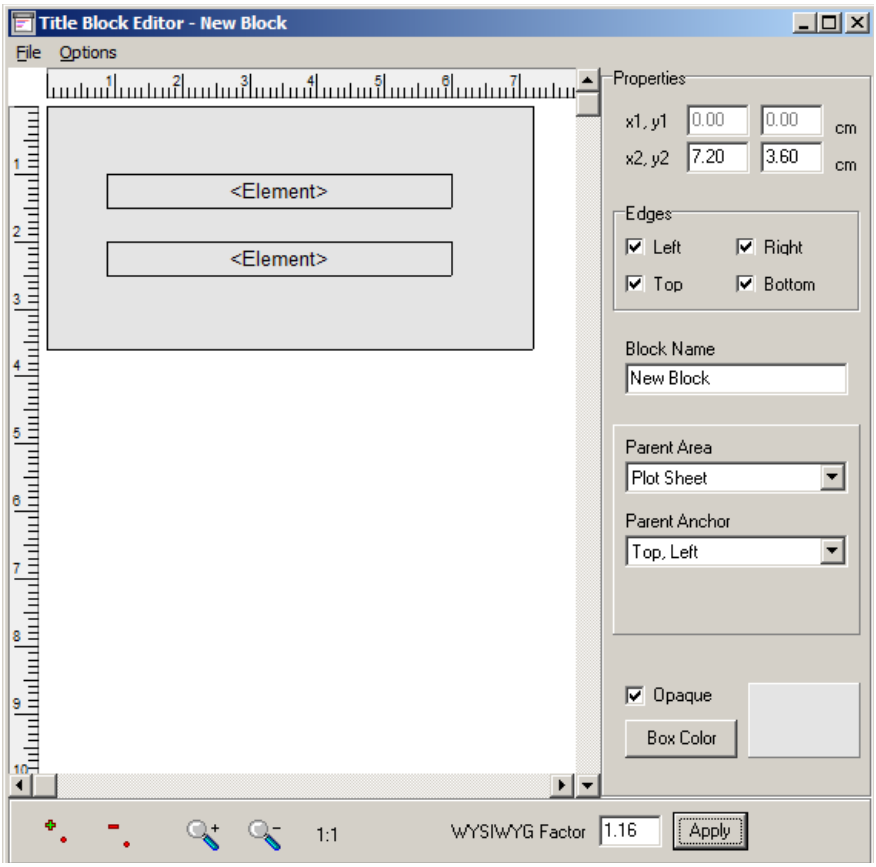
FIGURE 7-29. *The Sheet Information Tab*



CREATING A CUSTOM TITLE BLOCK TITLE BLOCK EDITOR

Whether you modify an existing title block or create a custom one of your own, you work in the Title Block Editor.

FIGURE 7-30. *Sample Title Block in the Title Block Editor*



To create a new title block:

1. **Open the Title Block Editor** by selecting SETTINGS-TITLE BLOCK EDITOR. The program will display an empty title block.
2. In the Title Block Editor, **select FILE-NEW**. The Title Block Editor will appear with only a 'container' rectangle defined.
3. **Set the Title Block properties**.
4. **Add the required elements to your Title Block**, setting the properties and entering the content for each one.
5. When you are finished, **save the title block** by selecting FILE-SAVE and naming your Title Block. The new title block will be saved, by default, to the Hypack_2011\Templates\Hyplot Title Blocks folder where it can be reused in future plots.

More Information

- "Editing a Title Block" on page 7-28
- "Setting Title Block Properties" on page 7-28
- "Working with Title Block Elements" on page 7-29

EDITING A TITLE BLOCK

If you have loaded a title block template, or another existing title block, you may need to customize the title block for the current plotting sheet.

To edit an existing block:

1. **Select the title block to be modified** in the Title Blocks dialog.
2. **Click [Edit].** The selected title block will appear in the Title Block Editor. By default, the title block properties are displayed on the right.
3. **Modify the title block as necessary**.
   - **Set the title block properties**
   - **Work with the elements. You can change any number of the following:**
     - number
     - properties
     - layout
     - content
4. **When you are satisfied, click [OK]** to return to HYPLOT.

More Information

- "Setting Title Block Properties" on page 7-28
- "Working with Title Block Elements" on page 7-29

SETTING TITLE BLOCK PROPERTIES

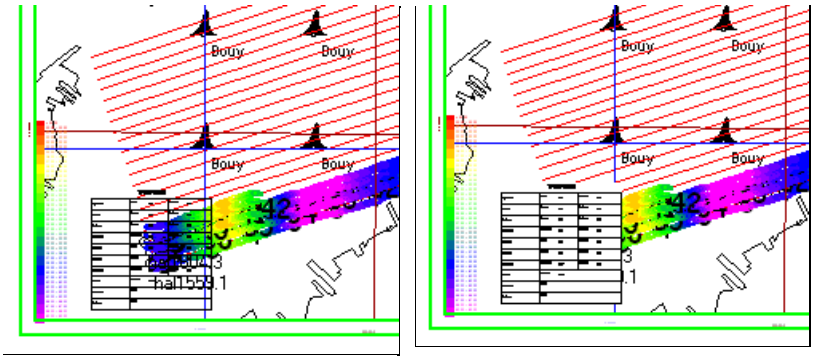
Title Block Properties apply only to the 'container' rectangle of the title block.

1. **Select the title block by clicking outside the title block in the design area.**
2. **modify the title block properties (right)**.
   - **X1, Y1**: Fixed at 0,0.
   - **X2, Y2:** Defines the size of the title block.
   - **Edges**: Check those edges that should be visible.
   - **Block Name**: Name your title block, preferably something that will indicate the content so you'll know if it will be useful in future plotting sheets.
   - **Parent Area** determines whether the title block will appear in the plotting sheet area or in the title block area.
   - **Parent Anchor** is the position in the Parent Area where the title block will reside. If you want the title block in some position other than one of the corners, select 'Bottom Left' and set **X and Y Offsets** to shift the block up and right respectively.

TIP: Alternatively, you can quickly position the title block anywhere in the plot by selecting the 'Bottom Left' option, then using the cursor in the plot display to drag the title block into position.

- **Opaque**: If you check the 'Opaque' box, the title block will plot with a solid background covering any data it overlays. Otherwise, it will have a clear background; you can see data that may be plotted behind it.

FIGURE 7-31. *Title Block - Non-Opaque (left) and Opaque (right)*



- **Box Color**: Click [Box Color] and select the background color to be used for opaque title blocks.

WORKING WITH TITLE BLOCK ELEMENTS

Think of a title block as a rectangular container with one or more rectangular elements within. The title block and each of its elements is drawn according to the properties which you will set in the area on the right-hand side of the editor. You can change the content; the number, arrangement and appearance of the elements and the display of the 'container' block.

Adding an Element

Click the Add Element Icon. A 'generic element' will appear in your title block for which you must now position and set properties.

Deleting an Element

Select the element you want to remove from the title block and click the 'Delete Element' Icon.

Setting Element Properties

1. **Select the element.** It's current properties appear at the right.
2. **Set the properties as desired for the selected element**.
   - **X1, Y1**: Position coordinates for the upper left-hand corner of the element relative to the upper left-hand corner of the block
   - **X2, Y2**: Position coordinates for the lower right-hand corner of the element relative to the upper left-hand corner of the block.

TIP: You can also use your cursor to reposition and resize elements within the title block.

Position the element by clicking anywhere inside the element display in your plotting sheet and drag it to its new position.

Resize the element by selecting the element then clicking and dragging the handles any of its sides.

- **Edges**: Check those edges that should be visible.
- **Text**: If you want text in the selected element, type the text you require in the field below 'Text'.
- **Picture**: If you want to display an image file, check the box then click [...] to browse for the required image location. The Title Block Editor supports JPG and BMP images.
- **Text Alignment**: Horizontal and Vertical positioning of your text within the selected element.
- **[Font]** accesses a font selection dialog.
- **Opaque**: If you check the 'Opaque' box, the element will plot with a solid background covering any data it overlays. Otherwise, it will have a clear background and you can see data that may be plotted behind it.
- **Box Color**: Click [Box Color] and select the background color to be used for opaque elements.

3. **Save the changes by selecting FILE-SAVE**. The Title Block Editor will automatically return you to the Control Panel.

TITLE BLOCK EDITOR DISPLAY OPTIONS

The program provides several display options that enable you to optimize your view while you work. These affect *only* the display within the Title Block Editor.

- In the Options menu:
  - **Units**: Choose to work in inches, centimeters or millimeters.
  - **Ruler**: Toggles the vertical and horizontal rulers on and off.
- **Snap to Grid**: Automatically aligns each side of your element to the nearest 0.625 inch [one sixteenth] or millimeter.
- **Zoom In/Out icons** adjust the scale by 25%.
- **[1:1]:** Sets the zoom scale to real world dimensions.
- **WYSIWYG Factor** adjusts the scale of the drawing in the Title Block Editor. It does not affect the size of the title block itself.

PLOTTING METHODS IN HYPLOT

When you have all of your data chosen and your display options configured, you're ready to send it to the plotter. With the exception of

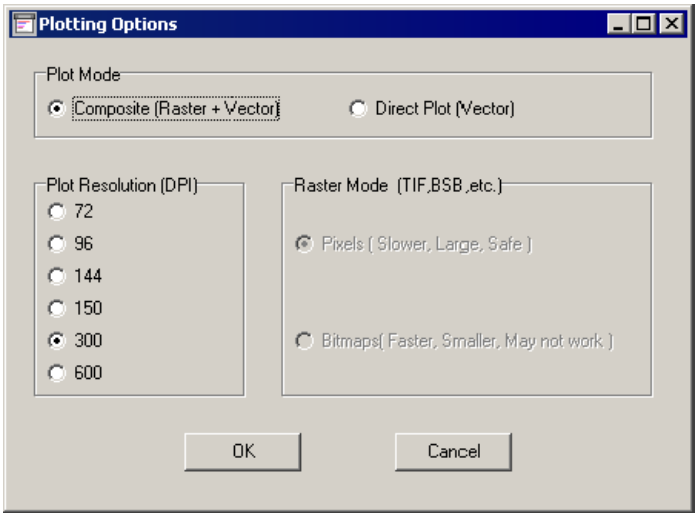
bitmap-based files, such as ARCS, BSB or TIF charts, HYPLOT can plot almost anything you can display on your computer screen.

To send your plot to the plotter:

1. **Select FILE-PRINT** and the Plotting Options dialog will appears with the recommended settings based on the files included in your plot..
2. **Verify your plotting settings.** HYPLOT offers 2 plotting method choices:
   - **Composite:** This option is more reliable if your plot includes raster data. It uses a process in memory that reproduces the more complex features found in raster charts.

     If HYPLOT detects raster data in the plot, the dialog will default to this method with a resolution of 300. Remember that resolution directly affects the size of the output file. If your system doesn't have enough memory, or if it's just taking too long to print, choose a lower resolution.

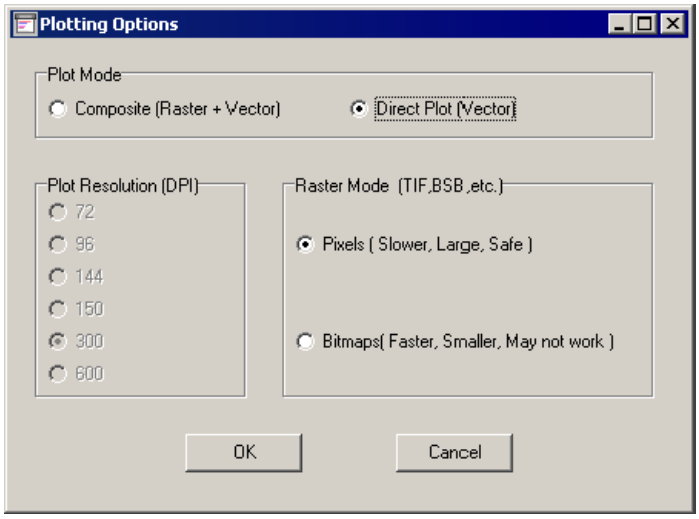
FIGURE 7-32. *Composite Plotting Options*



- **Direct Plotting** is faster and uses less memory, but it is only reliable for vector objects. It sends the data directly to the printer.

  If you have raster data, you can choose to override the Composite default. If this is your choice, you must also choose how HYPLOT will handle the complex colors of the raster data.

FIGURE 7-33. *Direct Plotting Options*



- **Pixels** converts the bitmap into a very large number of pixel color calls. So many in fact that the normal speed of direct plotting might be completely negated.
- **Bitmaps** options doesn't add too much overhead, but it is likely to generat an incorrect or unacceptable plot, because the program can't perform the coloration processes required for the more complex chart displays.

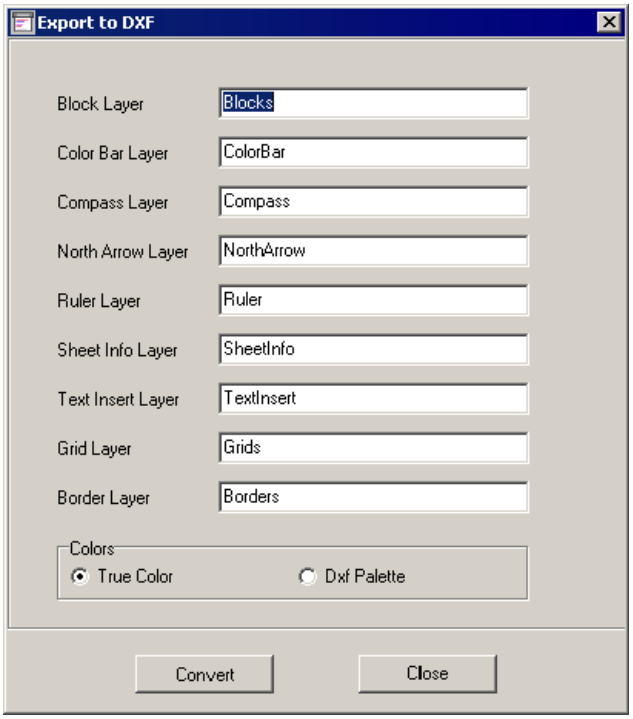
3. **Click [OK]** and wait for the plotter to finish!

EXPORTING YOUR PLOTTING SHEET TO DXF FORMAT

HYPLOT can export your entire plotting sheet to DXF format for our CAD users. The exported file includes borders, labels, scale bar, compass rose and most of the other display features offered in HYPLOT. We are not yet able to handle complex background files, such as Ortho-TIFs, BSB and ARCS charts.

1. **Click the Export to CAD icon** on the tool bar. The Export to DXF dialog will appear.

FIGURE 7-34. *Hyplot's Export to CAD Options*



2. **For each item listed, enter a layer name** to which that item will be drawn.
3. **Select your color palette** of your choice--true color or DXF palette.
4. **Click [Convert],** enter a name for your output DXF and click [OK].

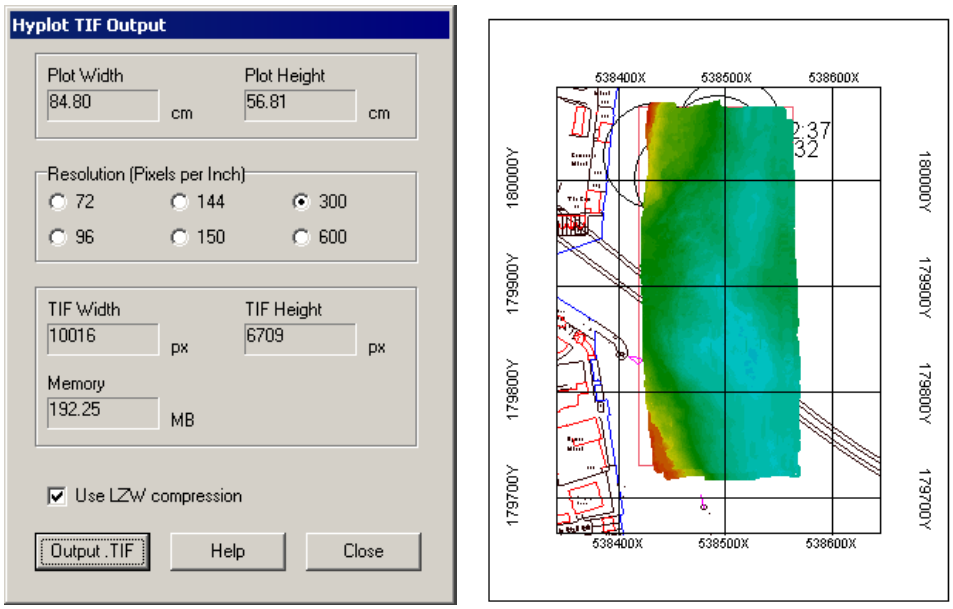
SAVING YOUR PLOT TO A TIF GRAPHIC

You can save an TIF image of your plot at your choice of six resolutions. When you choose your resolution, HYPLOT calculates and displays the dimensions and size of your potential image file. If the file size does not suit you, choose a different resolution before generating the file.

NOTE: This is *not* a geo-referenced TIF.

1. Select FILE-PRINT TO TIF. The HYPLOT TIF Output dialog will appear.

FIGURE 7-35. *HYPLOT TIF Output*



2. **Choose the resolution of the image** and check the calculated size of the proposed TIF.
3. **Choose whether to use LZW Compression.** This is a lossless compression algorithm that significantly reduces the resulting file size without losing resolution of the image
4. **Click [Output TIF]** and name the file. The TIF file will be saved, by default to your project folder.

CROSS SECTIONS AND VOLUMES

The CROSS SECTIONS AND VOLUMES program enables you to use edited or sorted ALL format data files to:

- Plot cross section graphs for each survey line.
- Calculate volume information with your choice of several calculation methods.

RUNNING CROSS SECTIONS AND VOLUMES

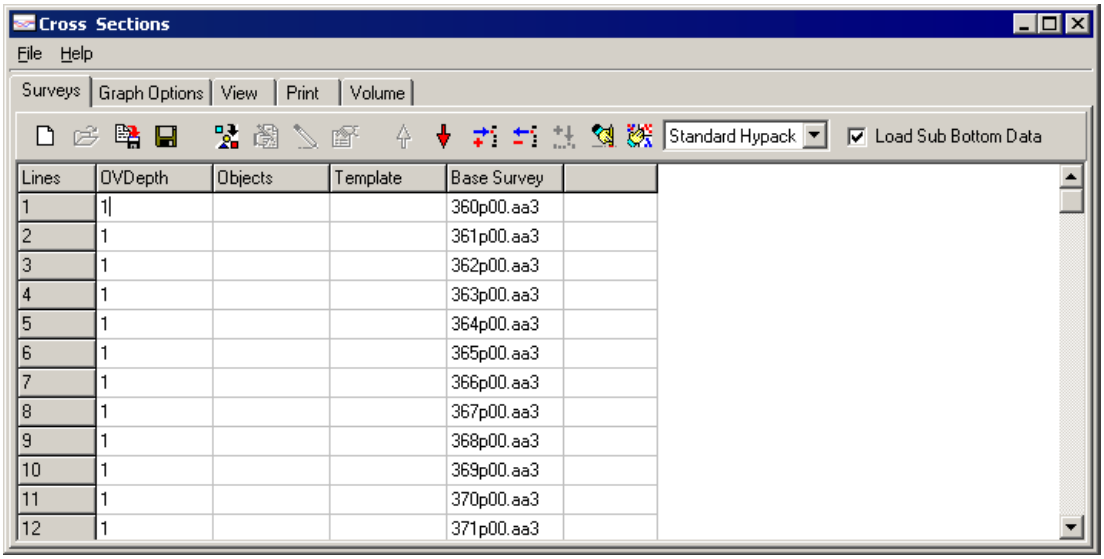
1. **Start the program** by selecting FINAL PRODUCTS-CROSS SECTIONS AND VOLUMES or the corresponding icon. The CROSS SECTIONS AND VOLUMES window will come up with a series of tabbed dialogs.
2. **Open a session**. A session is a collection of files and settings with which the program calculates your volumes. Initially, you must begin with a blank session then load the files and select the options appropriate for your project requirements. If you save your session, you can later re-open the session and all of the files and settings will automatically be reloaded to the program.
   - **Open a new, blank session** by selecting FILE-NEW SESSION.
   - **Open a pre-existing session** by selecting FILE-OPEN SESSION and choosing the name of the session (*.CSS).
3. **Select your calculation method** from the drop-down box on the icon bar.
4. **Enter the information in each tab**.
   - The **Surveys Tab** requires information regarding your survey data and calculation methods.
   - The **Graph Options Tab** defines how your cross section graphs will be displayed. Here, you make choices about the appearance of the grid, labels and annotations.
   - The **View Tab** enables you to preview the cross section graphs. You may also adjust the scale and segment of the cross section to include in the graph.
   - The **Print Tab** enables you to setup and print the cross section graphs.
   - The **Volume Tab** displays an online preview of your volumes calculations.
5. **Save your settings** by selecting FILE-SAVE SESSION (overwrites file of same name) or FILE SAVE SESSION AS (saves to a new file) and naming the file. The settings will be saved to the project directory with the *.CSS extension.

SURVEYS TAB IN CROSS SECTIONS AND VOLUMES

Once you start the CROSS SECTIONS AND VOLUMES program, the program's Surveys Tab will appear. This spreadsheet enables you to enter up to eight different sets of survey data, which provides visual comparison of the overlaid data to the Base Survey data in the View tab, and volume comparison calculations in End Area 3 and other post-dredge volumes calculation methods.

In this tab, you will also choose the calculation method, load your survey data, specify your overdepth and superdredge depths as applicable, and set your pen properties.

FIGURE 7-1. *Sample Surveys Tab*



LOADING SURVEY DATA IN CROSS SECTIONS AND VOLUMES

Here is where you load your edited survey data. The files will be listed in the column in the same order that they are listed in the catalog file.

1. **Click in the column** where you want the survey data to be loaded—typically the top cell.
2. **Select File-Open.** You will be presented with a list of Catalog files from the current Edit directory. Alternatively, you can load files from the Sort directory.
3. **Select your data.**
   - If you select a Catalog (*.LOG) file, the program will read the data files from the Catalog and list them in sequence, as found.
   - You may also choose to load individual ALL format files by changing the Files of Type field then selecting your file.

   You may open up to eight files (one in each of the next seven columns to the right) if you wish to compare surveys. If you are doing post-

dredge volumes calculations, enter the pre-dredge data as the base survey and the post-dredge data in the next column to the right.

NOTE CROSS SECTIONS AND VOLUMES does not support data on curved survey lines.

It may, at times, be necessary to edit the contents of the spreadsheet to correct errors or to line up overlaid files to coincide with the base survey. The icon bar includes several buttons that assist you in these tasks. Hold the cursor over the icon to view the function of each.

NOTE When more than one catalog is loaded, it is good practice to click the Sort icon to match files from the same survey lines.

Move Selection Up and **Move Selection Down:** Click anywhere in the spreadsheet, then click one of these icons to move the cell contents up or down in the column.

Insert Line: Click in the spreadsheet then the icon. A blank row will appear in the spreadsheet.

Delete Line: Click in the spreadsheet then the icon. The selected row will be removed.

Delete Selection: Deletes the contents of selected cell(s).

Sort Files: Sorts the filenames of Sounding files to match the order in Base Survey.

Load Sub-bottom Data: If you have logged sub-bottom data (saved as SEG files in your raw folder), check this option to display the sub-bottom profile behind the depth profiles.

SPECIFYING OVERDREDGE AND SUPERGRADE DEPTH

OVDepth represents the Overdredge Depth. Because it is not possible to dredge exactly to the design grade, it is customary to pay for a small amount of dredging below. This is referred to as overdredge and the allowed distance is the overdredge limit. In the CROSS SECTIONS AND VOLUMES program, we call this limit the Subgrade.

Enter the Subgrade for each survey line. If this value is the same for each line, enter the value in the first cell and click the Fill Column icon.

SpDepth represents the Supergrade Depth, a third grade below the sub-grade supported by some methods. This is sometimes used as an advance maintenance limit.

Enter the **Supergrade** for each survey line. If this value is the same for each line, enter the value in the first cell and click the Fill Column icon.

TEMPLATES IN CROSS SECTIONS AND VOLUMES

Channel Templates, also known as Cross Section Design Templates, are typically created in CHANNEL DESIGN based upon the geometry of the channel. They may also be created in the LINE EDITOR or CROSS SECTIONS AND VOLUMES program. The SURVEY program logs the template information directly to the header of the RAW data file. When editing the data file in the Editor program, the template information is displayed to the screen and is written to the header of the EDITED data file.

The CROSS SECTIONS AND VOLUMES program will use the channel template information found in the Base Survey data files, unless another template has been added in the Template column.

BASIC INFORMATION ABOUT TEMPLATES

- Since **templates consist of distance and depth pairs**, if your channel is the same throughout the project, you can use the same template for every cross section. If your channel is different, you may have to make a new template file for every survey line.
- **The points of your channel template must always go in order from the start to end of the line.** You cannot "backtrack". The first point you specify should be the top of the left toe, followed by the bottom of the left toe, followed by all your other points. The points of your channel template are referenced to the origin of the planned survey line. The "0.0" distance point may not be the top of the left toe of the channel.
- **The Average End Area method supports only four points in each template.**
- **The Standard HYPACK® method supports up to 21 points in each template.**
- **Every template has to have the same number of points** unless you are using the Average End Area No Segments calculation method**.**

LOADING PRE-EXISTING TEMPLATE DATA

1. **Click in the spreadsheet where you want to use the Template file and select FILE-OPEN**. A File Selection dialog will appear.
2. **Select the file with the template data**. You can use either:
   - a Template file (*.TPL).
   - a 3-dimensional Planned Line file. The Line file must contain channel template information, for this purpose.

Its name will appear in the Template column at the insertion point.

The **Fill Column icon** will fill the column with the same file name from the insertion point to the end of the file.

You can choose, in the Graph Options Tab, to **align the template data** in the file header with the new template:

- **at the Start of Line points**.
- **at the Center Lines**. If your new template has an even number of points, the program will calculate a point midway between the two

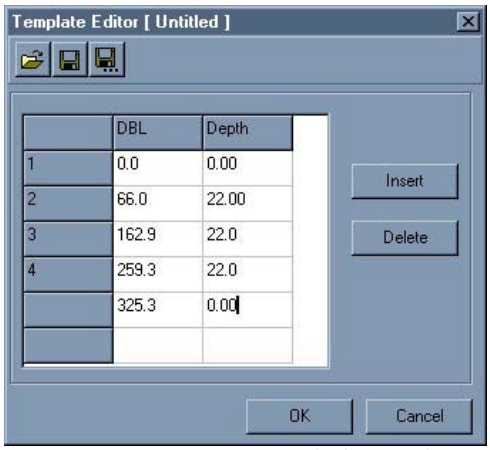
centermost points of the template and align it to the center line of the template information in the header file.

CREATING NEW TEMPLATES WITH THE TEMPLATE EDITOR

You may elect to create a new Template file to substitute for the template information for all or some of your survey lines. The Template Editor is launched by clicking the icon on the Survey Tab of the CROSS SECTIONS AND VOLUMES program.

1. **Click the cursor in any of the rows under the Template column** where you wish to use the new template, then on the Edit icon. The Template Editor window will appear.

FIGURE 7-2. *Template Editor*



2. **Enter your template information**. A template is a listing of distances (Distance from the Beginning of Line) and their corresponding depths. List them in order from the left toe to the right toe.
3. Upon completing the list, **save your template file** by clicking on the SAVE or SAVE AS icon and give your template a name. The information will be saved with a TPL extension to the project directory and placed in the cell where the cursor was originally placed.

NOTE: You can edit your template files by opening it in the Template Editor then modifying and saving the new information. The changes will affect the current line and all lines using that template file.

You may use the same template for every file in the CROSS SECTIONS AND VOLUMES program by placing it in the first cell and clicking on the Fill Column icon. You may also create a separate template for every data file.

USING BOX TEMPLATES

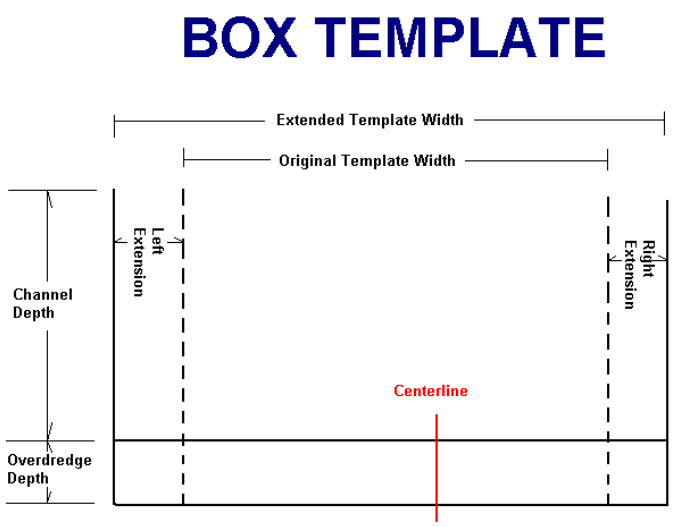
If you are using the Philadelphia method, you may choose the box template option which uses the channel template center channel information but omits the side slopes and places vertical lines from the toes. You can extend the box template out from the toes in the GRAPH

OPTIONS-VOLUMES Tab. Extend the sides by entering left and right extensions.

NOTE CROSS SECTIONS AND VOLUMES calculates volumes only to the top of bank position. Therefore, the extensions must remain within the bounds of the top of bank.

The project depth may be increased by entering a project depth greater than the template depth. (If the project depth in the Philly setup is less than the channel template depth, the program will use the channel template depth.) The Above Channel and Overdredge volumes will then be calculated for each segment (Left and Right Extensions, Left and Right of Center line).

FIGURE 7-3. *The Box Template in the Philadelphia method*



More Information

- "Cross Section-based Volumes Calculation Methods" on page 7-54

OBJECTS IN CROSS SECTIONS AND VOLUMES

The Objects column contains a file that describes any fixed features, such as pipelines and anything else your care to describe with a polyline. The information is created and saved in the OBJECT EDITOR that may be accessed by placing your cursor in the Object column and clicking on the Edit icon in this window or in the View or Print window.

LOADING PRE-EXISTING OBJECT FILES

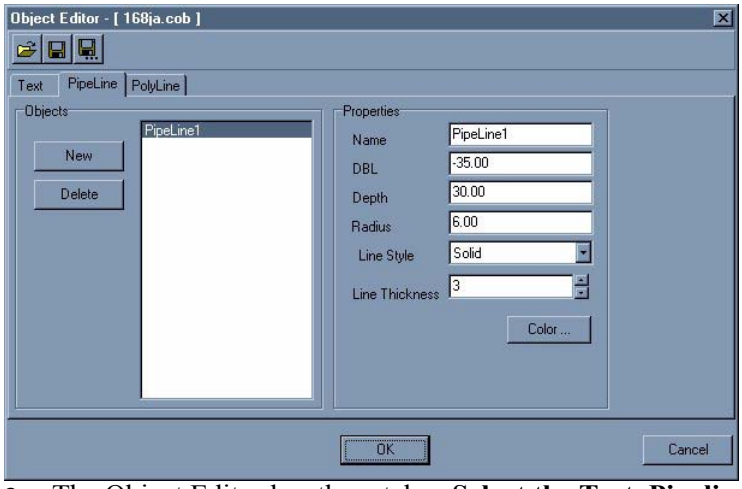
1. **Click in the spreadsheet where you want to use the Object file** and select FILE-OPEN. A list of available Object Files will be displayed.
2. **Select which Object file you want,** and its name will appear in the Object column at the insertion point. [Fill Column] will fill the

column with the same file name from the insertion point to the end of the file.

CREATING OBJECT FILES WITH OBJECT EDITOR

1. **Position the cursor in the cell of the Objects column** where you want the new object file to appear and click the Editor icon.

FIGURE 7-4. *Objects Editor – Pipeline Window*



2. The Object Editor has three tabs. **Select the Text, Pipeline and Polyline tabs to access windows where you may define the position and appearance of each of these features** in your cross section.
3. **Enter as many features as you wish**.
4. **Save your file** by clicking on the SAVE or SAVE AS icon. Name your file and it will be saved to your project file with a *.COB extension.

NOTE: You can exit the Objects Editor without saving the file and the template information will still be placed, "Un-named" in the selected cell in the Objects column. If you later decide to save the data, select FILE-SAVE FILES and provide a name.

SETTING PEN PROPERTIES

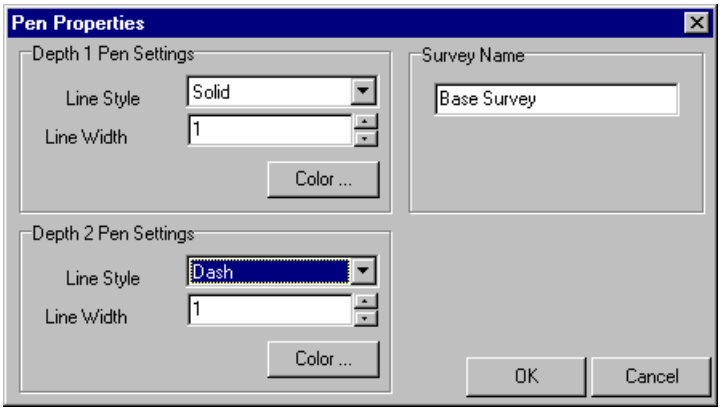
The default settings for survey and template lines is solid black and 1 point in width. If you are displaying overlaid files, you may want to change the color or style of the lines to help distinguish between the data sets more easily. You can also change the column heading if you wish.

1. **Click in the Templates column** or any column with sounding data listed.
2. **Click on the Pen Properties icon** and the Pen Properties Dialog will appear.
3. **Set the color, style and thickness for the data set and name your data set**. Click OK.

4. **Repeat the process for each data set** you wish to change from the default.

You can see the results in the View and Print tabs.

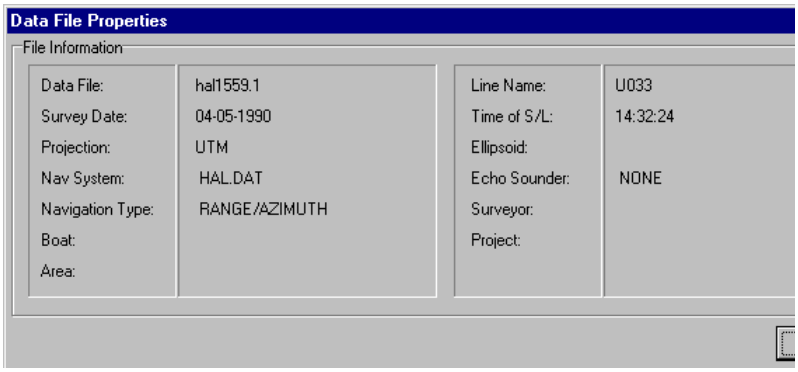
FIGURE 7-5. *Pen Properties Dialog*



DISPLAYING PROJECT INFORMATION

Data File Properties: Click in any column where sounding data is loaded then click on the icon. A display will appear with the Project Information that was supplied in the SURVEY program.

FIGURE 7-6. *Data File Properties Window*

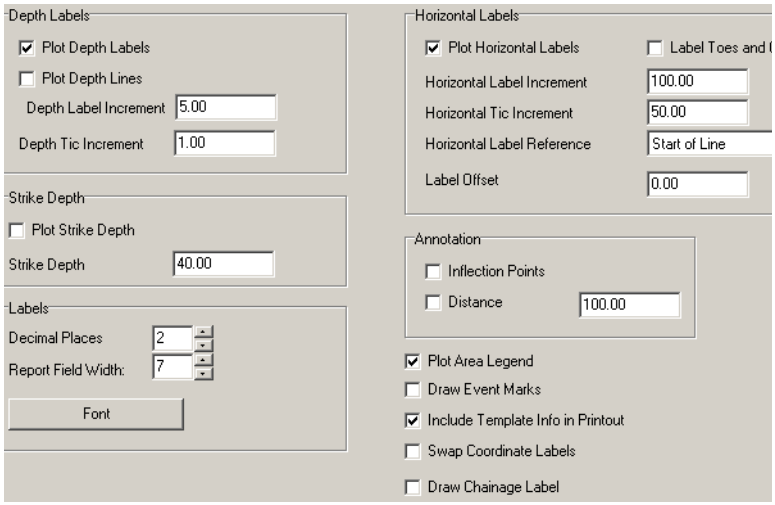


GRAPH OPTIONS TAB IN CROSS SECTIONS AND VOLUMES

In the Graph Options Tab, define how your cross section graphs will be displayed. Here, you make choices about the appearance of the grid, labels and annotations.

LABELING YOUR CROSS SECTION GRAPHS

FIGURE 7-7. *Graph Options-Labeling Tab*



Plot Depth Labels places numeric labels on the vertical axis of the graph.

Plot Depth Lines places dotted lines at user-specified depth across the graph.

Depth Label Increment and **Depth Tic Increment** specify the distance between depth markings on the vertical axis.

The **Strike Depth** options enable you to place a horizontal reference line at the specified depth.

Decimal Places and **Font** are used to determine the number of decimal places (up to 6) and the font for all labels.

Plot Horizontal Labels and **Label Toes** and **Center** mark user-specified points across the line. The labels appear only on the top and tics appear on both the top and bottom line of the graph.

Horizontal Label Increment and **Horizontal Tic Increment** determine the frequency of the labels and tics.

Horizontal Labels Reference: You may choose the point that will be designated as the '0.00' point on your line. Any points to the left of the designated point will have a negative distance value measured from that point. Likewise, points to the right will have a positive value.

Label Offset: The horizontal zero point shifts this distance to the right of the specified Horizontal Labels Reference.

The **Annotation** option enables you to label the depth, at the channel inflection points (such as toe lines, center line, etc.) or in user-specified increments. The labels appear at the top of the graph and appear for each group of survey data.

Plot Area Legend displays color-coded numerical Volumes information in the View window for each defined area of the survey.

Check **Draw Event Marks** to display the event marks in the View window.

Include Template Info in Printout includes the position on the line for each inflection point in your template relative to the Horizontal Labels Reference and any subgrade and supergrade depths for each section in the volumes report using the End Area calculations methods.

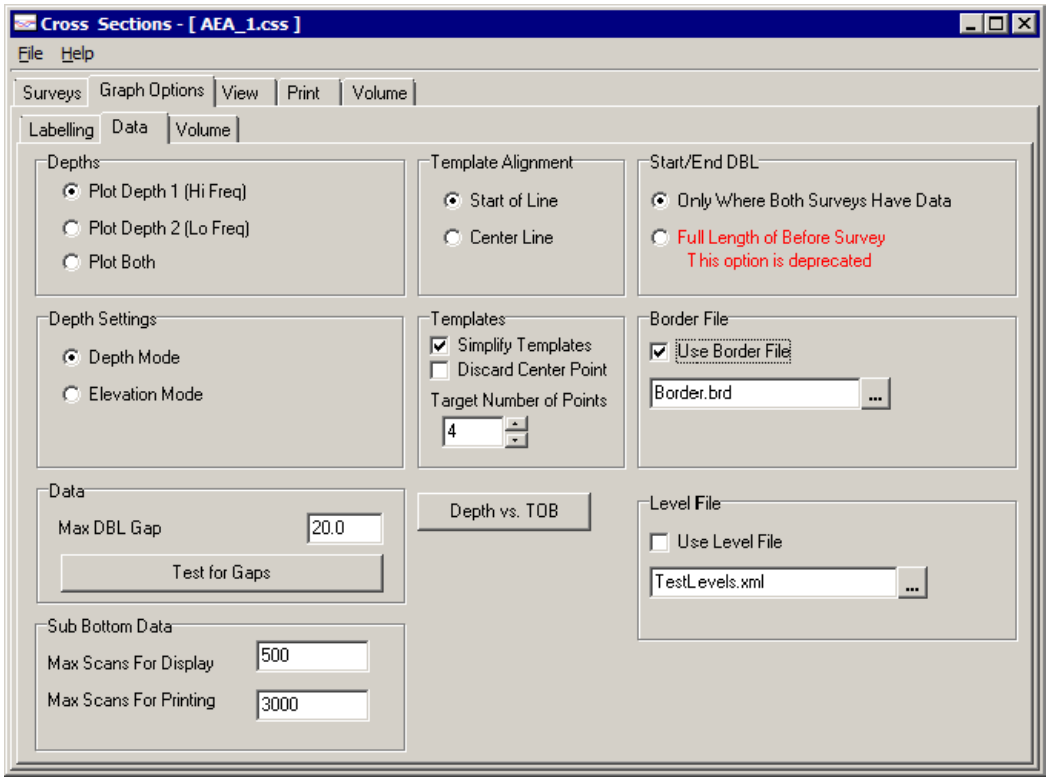
.**Swap Coordinate Labels:** Changes labels for users for whom the X axis is Northing and Y axis is Easting.

FIGURE 7-8. *Horizontal Labels Reference*

Draw Chainage Label prominently displays the chainage in the top center of each section. This affects both the View and Print displays.

DATA DISPLAY SETTINGS IN CROSS SECTION GRAPHS

FIGURE 7-9. *The Graph Options Window-Data Tab*

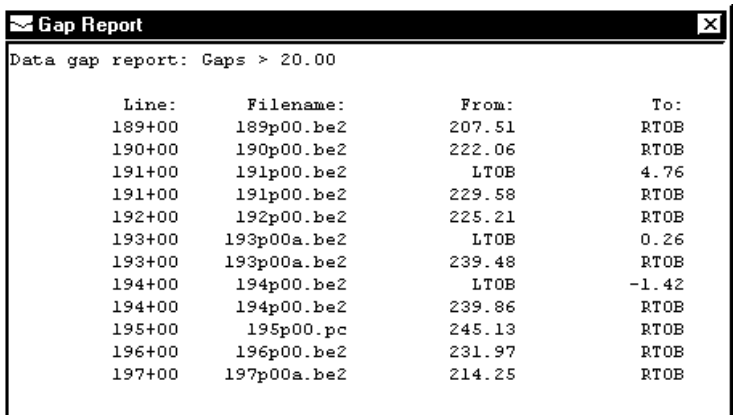


Choose whether to plot **Depth 1** (normally the high frequency), **Depth 2** (normally the low frequency) or **Both**. (Wait until you see that plot with eight different surveys with two depths each!)

Depth Mode plots the data as it appears in your files while Elevation Mode inverts it.

Max DBL Gap: During the editing process, if you have deleted points or blocks of points from your data, there will be "gaps" in your data. Typically, your intention would be to connect the points on either side of the gap with a straight line. You may, however, specify a maximum distance to be "closed" in this manner. Any "gap" in the data larger than this distance will show a "gap" in the line representing the survey data on the graph. You can obtain a listing of these areas by clicking [Test for Gaps].

FIGURE 7-10. *A Sample Gap Report*



Template Alignment options provide a choice to align a template loaded to the template column with the template information in the header of the data. If your new template has an even number of points (no center line), the program will calculate a point midway between the two centermost points of the template and align it to the center line of the template information in the header file.

Simplify Templates: In simple channels, HYPACK® can eliminate some extraneous zeros that may otherwise clutter your report. Select this option only if you are working in a simple channel.

Discard Center Point: When this option is selected and the template has nine points, the fifth point is discarded when the template is simplified. If the template does not have nine points, no point will be discarded.

Target No. of Pts. This is the number of points you think would define the cross section in its simplest form. The minimum number would be four, representing the start of the line, the left toe, the right toe and the end of line. Five points are necessary if you need separate calculations for each side of the center line.

[Depths vs TOB] displays a listing of files with data shoaler than the top of bank depth. For each file you can see what the top of bank depth is, the

number of soundings above the top of bank and the shoalest depth in each file.

FIGURE 7-11. *A Sample Top of Bank Report*

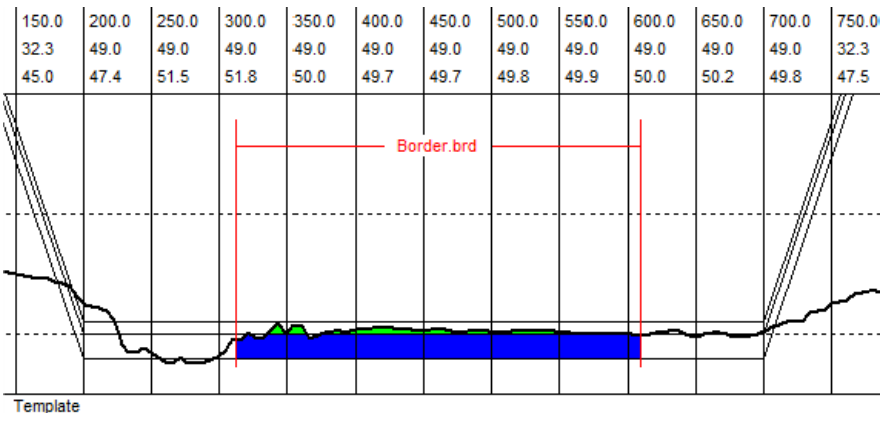
Depths vs. TOB report: Depth <= TOB

Line:	Filename:	TOB:	Count:	Worst Shoal:
1+00dam	chdes2001.chd	0.00	38	-65.96
2+00dam	chdes2002.chd	0.00	36	-71.14
3+00dam	chdes2003.chd	0.00	40	-61.67
4+00dam	chdes2004.chd	0.00	43	-74.99
5+00dam	chdes2005.chd	0.00	43	-65.59
6+00dam	chdes2006.chd	0.00	42	-67.09
7+00dam	chdes2007.chd	0.00	45	-60.89
8+00dam	chdes2008.chd	0.00	45	-70.04

Start/End DBL: These options are only applicable to the End Area 3 volumes calculation method that compares two surveys.

A Border File can be used to limit the area where volumes are calculated. Just check the box and click the ellipsis to select the Border File that defines the area within which you want to calculate volumes. You can see the extents of the border file for each section in the View tab.

FIGURE 7-12. *Border File in the View Tab*



Use Level File , is used for Core Volume calculations. Click the […] and browse for your Core Level file.

More Information

- “Chinese 1 Core Volumes” on page 7-88

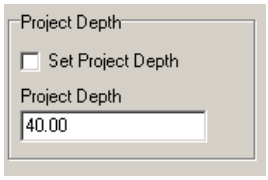
SETTING TEMPLATE OPTIONS FOR VOLUMES REPORTS

The Volume Tab changes according to which calculation method has been selected.

Project Depth The Average End Area methods, as well as the Philadelphia and Jacksonville methods allow you to quickly change the project depth and

view the effects in your profile views and volumes calculations. This option overrides the project depth defined in your data files and in any template file and assumes a flat bottom for the entire channel.

FIGURE 7-13. *Project Depth Options*

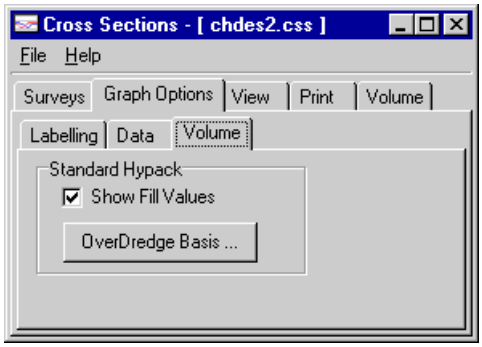


To modify the project depth, check the 'Set Project Depth' option and enter the new project depth in the field provided.

Standard HYPACK® Options

Options for the Standard HYPACK® method are few.

FIGURE 7-14. *The Graph Options-Volume Tab for the Standard HYPACK® Method*



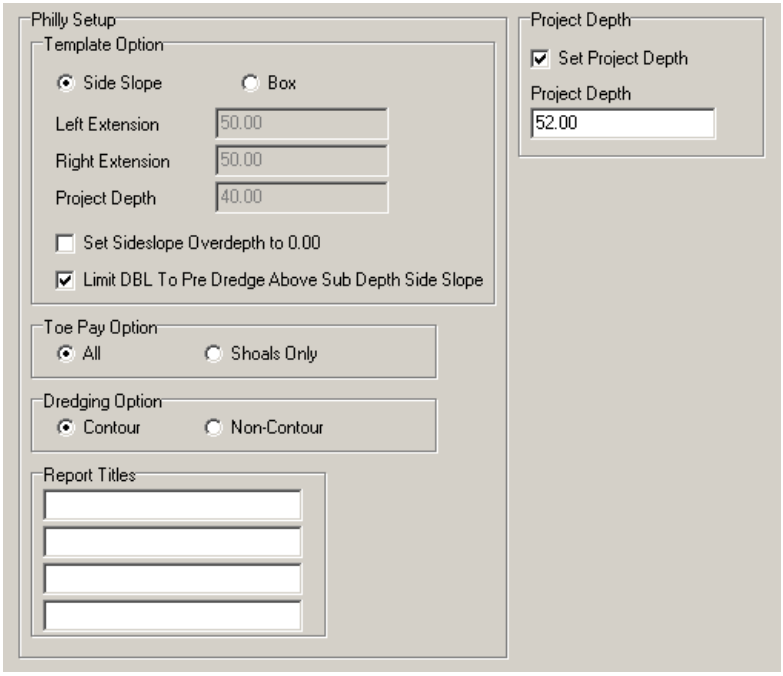
Show Fill Values: Uncheck the box to omit Fill Values from the report.

[Overdredge Basis]:

- **Smart** is for contour dredging.
- **All** includes all overdredge material.
- **None** excludes all overdredge material.

The **Philly Setup** is described under the Philadelphia Method of the "Cross Section-based Volumes Calculations" section.

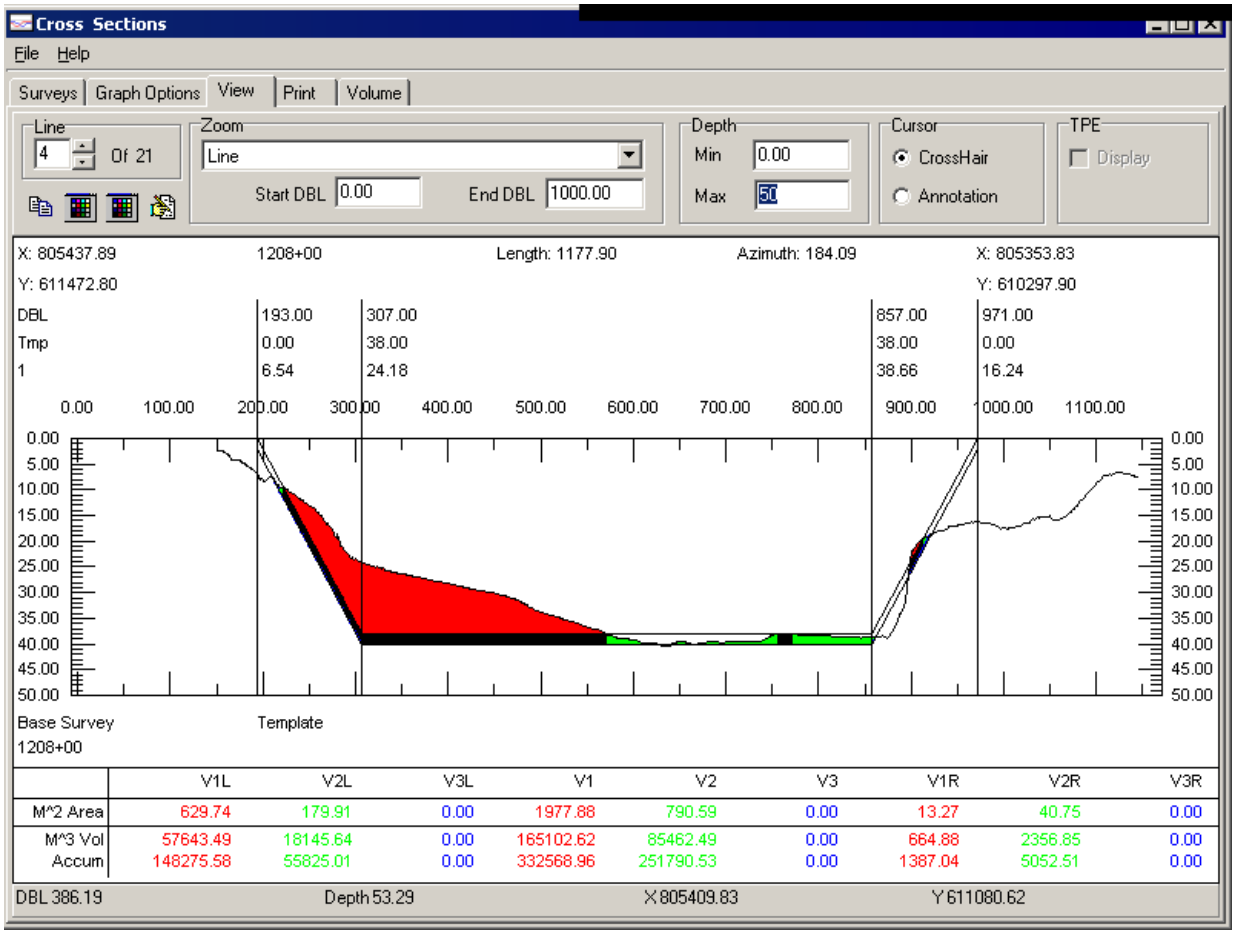
FIGURE 7-15. *The Graph Options-Volume Tab for Philly Method*



VIEW TAB IN CROSS SECTIONS AND VOLUMES

The View Tab enables you to preview the cross section graphs. You may also adjust the scale and segment of the cross section to include in the graph.

FIGURE 7-16. *The View Tab*



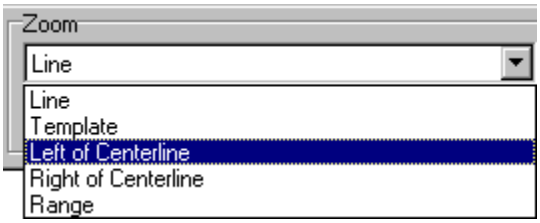
When you click on the View tab, the screen will present the first cross section of the file(s) you have according to the options you have chosen in the GRAPH OPTIONS window. The corresponding volumes calculations appear below the graph.

There are 4 icons below the Line frame. Below, they are described from left to right.

- You may save the graph and volumes figures to the clipboard by clicking on the 1st icon.
- Activates a dialog to adjust the fill colors that are used in the graph.
- Activates the project Colors dialog.
- Activates the Object Editor.

The **Line** option allows you to elect which section you want to view by entering a number that corresponds to the row number of the spreadsheet.

FIGURE 7-17. *Zoom Options Window*



The **Zoom** is used to determine how much of the cross-section will be viewed in the graph. To view the entire cross section, choose the **Line** or **Template** option. To view only a portion of each line, you may choose **Left** or **Right of the Center line** or you can specify a Range by entering **Start** and **End DBL** values.

These settings are used to set the limits of the graph. The **Minimum** designates the top of the chart. If you are working in elevation mode, you have to set the minimum higher than the maximum!

Cross Hair: Move the intersection of the cross hair over any point with the mouse and you can read both depth and DBL information from the graph or from the bottom bar of the window. The bottom bar also displays the X and Y coordinates for that point.

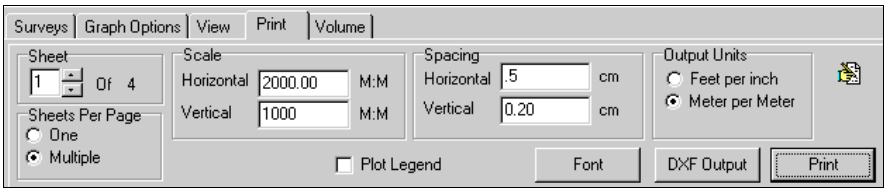
Annotation: As you move your cursor to any point across the line, horizontal annotation lines move to show you the depth at that point on the line for each file loaded. The Bottom bar of the window displays the DBL and Depth information for the Base Survey and Template, as well as the X and Y coordinates.

TPU Display: If you have Total Propagated Uncertainty (TPU) information in your data, the program will mark an area equal to the TPU value on either side of the single beam profile. This TPU 'envelope' appears as a clear, cross-hatched area in the View Tab.

PRINT TAB IN CROSS SECTIONS AND VOLUMES

The Print Tab enables you to setup and print the cross section graphs. The Print Setup window, accessed by clicking [Print], is used to specify your printer and the paper size and orientation. If you do not use this function, your print job will be sent to your default Windows® printer.

FIGURE 7-18. *The Print Tab*



Sheet indicates which line of your file(s) you are currently viewing. You may use the arrow buttons to select any line in the file.

Sheets per Page

- **One** plots one cross section per page.
- **Multiple** enables you to plot more than one cross section to a page. The Scale, Spacing and Output Units, together determine how many will fit on one page. Adjust these until the results displayed in the lower part of the window are satisfactory.

The **Horizontal Scale** and **Vertical Scale** are expressed in Feet/Inch for foot-based data and relative scales for metric data.

The **Object Editor** is again available in this dialog for convenient editing of your objects.

Plot Legend prints project information that has been entered in the SURVEY program such as Project Name, Surveyor, Date, Data File Name, etc.

[Font] enables you to choose the font of the text from the standard Windows® Font Dialog.

[DXF Out] enables you to plot your cross section information to a DXF file.

1. **Set your Horizontal and Vertical Scale factors** in the Print Tab.

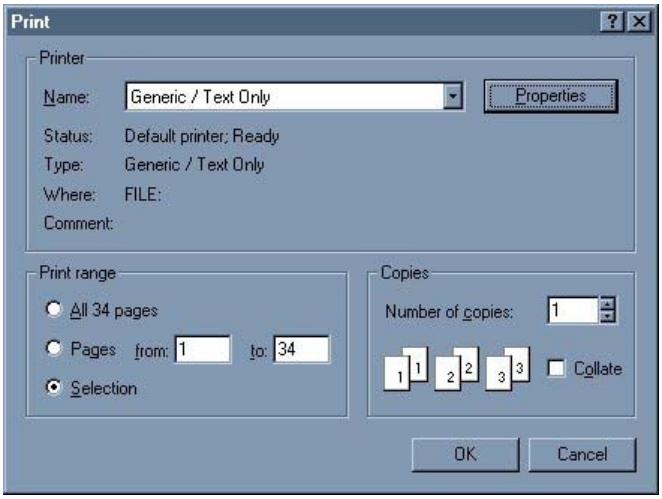
NOTE: For DXF files drawn most accurately to scale, set your scale values to 1. Any further scaling is better done in AutoCAD.

---

2. **Click [DXF Out]** to bring up its dialog.
3. **Set your plot settings** as follows:
   - The **Text Height** and Width is expressed in inches for foot-based data and centimeters for metric-based data.
   - **Number of Columns** and **Number of Rows** indicates how you would like the cross section plots to be arranged on the plotter sheet.
   - **Plot View** determines which line numbers you wish to plot.
4. **Click [Plot]** to send it to a *.DXF file.

[Print] brings up the Windows® printer window. CROSS SECTION AND VOLUMES uses the default printer to create cross section prints or a PDF document.

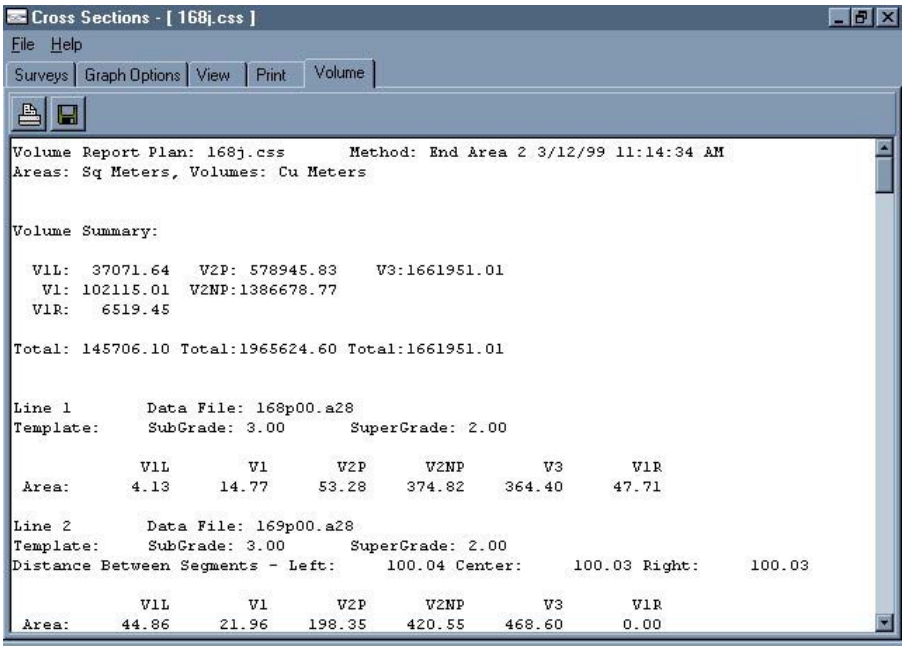
FIGURE 7-19. *Print Options Window*



VOLUMES TAB IN CROSS SECTIONS AND VOLUMES

The Volumes Tab presents a view of the volumes report generated according to the choices you have made in the previous windows. You may view it in the window by using the scroll bar.

FIGURE 7-20. *Volumes Tab*



Save your Volumes Report for future use by clicking on the SAVE VOLUME REPORT icon in the upper left-hand corner of the window.

You will be asked to name your file and it will be saved with the *.VOL extension.

Print your report by clicking on the PRINT VOLUME REPORT icon in the upper left-hand corner of the window. The Windows® Print Window will appear for you to determine the printer and how many copies of the report you would like to print. It is not possible to print only a portion of the VOLUMES REPORT.

Cross Section-based Volumes Calculation Methods

The CROSS SECTIONS AND VOLUMES program is used to calculate dredge volumes from cross channel survey files, typically spaced at 100-foot intervals. Planned lines for the survey are usually created with the LINE EDITOR or CHANNEL DESIGN programs. The start and end points are included in the survey files.

The survey data is compared to channel templates, which are basically the cross section of what the channel is supposed to be (project depth, toe locations and side slopes). The comparison shows the difference between the channel and its design specifications, and that difference can be calculated as an area. The area is called the Average End Area, and is the basis of the calculation method of the same name.

If there is no template information embedded in the survey files. Templates may be created with the TEMPLATE EDITOR in the CROSS SECTION AND VOLUMES program and stored in *.TPL files. These may be used with line files with no template information embedded in them, or to substitute for embedded template information.

Because it is not possible to dredge exactly to the design grade, it is customary to pay for a small amount of dredging below. This is referred to as overdredge and the allowed distance is the overdredge limit. In the CROSS SECTION AND VOLUMES program, we call this limit the Subgrade.

Comparison of Volumes Calculation Methods in Cross Sections and Volumes

It seems that everyone has a slightly different idea about how volumes should be calculated. The original method (Standard HYPACK®) was an attempt to make everyone happy. The table below gives a brief comparison of the computation methods included in the CROSS SECTION AND VOLUMES program. Select your computation method in the Survey Tab.

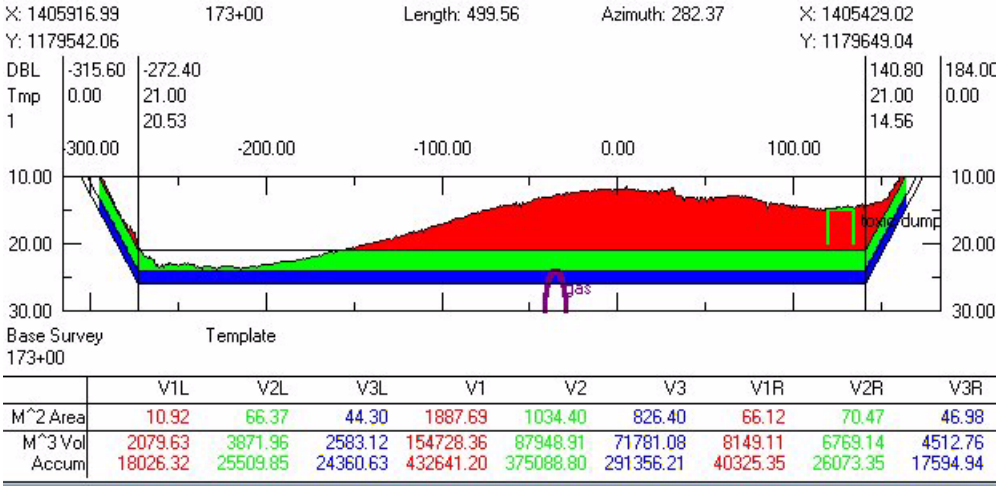
Name	Method	Contour Dredging	Predredge vs. Postdredge	Center line Reference	Grades	Segments	Fill Values
Standard HYPACK®	Prismatic	Yes	No	No	2	3 to 20	Yes
End Area 1	End Area	Yes	No	No	3	3	No
End Area 2	End Area	No	No	No	3	3	No

Name	Method	Contour Dredging	Predredge vs. Postdredge	Center line Reference	Grades	Segments	Fill Values
End Area 3	End Area	Yes	Yes	No	3	3	No
AEA No Segments	End Area	No	No	No	2	N/A	No
Philadelphia	End Area	Yes	Yes	Yes	2	4	No
Norfolk	End Area	No	No	No	3	3	No
Savannah	End Area	No	No	Yes	3	4	No
Jacksonville	End Area	Yes	Yes	No	2	4	No
Panama City	End Area	No	No	No	3	4	No
Chinese 1 AEA1	End Area	No	No	No	2	4, 6 or 8	No
Chinese 1 AEA3	End Area	No	Yes	No	2	4, 6 or 8	No
Chinese 2 AEA1	End Area	No	No	No	2	4	No
Chinese 2 AEA3	End Area	No	Yes	No	2	4	No
GLDD 1	End Area	No	No	No	3	4	No
GLDD 3	End Area	No	Yes	No	3	4	No
Kingfisher	End Area	No	No	No	3	4	No

The **Average End Area Method** calculates the average of material above or below a grade. It is a standard used throughout the hydrographic and dredging industries. Although it is not the most accurate method, it is simple enough that results can be verified by hand calculation.

The following figure gives the basic idea behind End Area calculation. The topmost area in the graph is the area above the design template, and the middle layer is the area above the subgrade template. If a supergrade is included in your design, it will be the third level.

FIGURE 7-1. *Channel Cross Section with End Areas shaded in*



	V1L	V2L	V3L	V1	V2	V3	V1R	V2R	V3R
M^2 Area	10.92	66.37	44.30	1887.69	1034.40	826.40	66.12	70.47	46.98
M^3 Vol	2079.63	3871.96	2583.12	154728.36	87948.91	71781.08	8149.11	6769.14	4512.76
Accum	18026.32	25509.85	24360.63	432641.20	375088.80	291356.21	40325.35	26073.35	17594.94

The legend, in the lower portion of the window, may give volumes figures for each of the defined areas of the cross section according to the method you have chosen. The areas are defined as follows:

TABLE 7-1. *Volume Area Definitions*

V1:	The volume of material above the design surface in the center of the channel.
V1L:	The volume of material above the design surface of the left bank.
V1R:	The volume of material above the design surface of the right bank.
V2:	The volume of material between the design and the subgrade surfaces in the channel center.
V2P:	The volume of material between the design and the subgrade surfaces in the channel center where the depth is less than the design surface.
V2NP:	The volume of material between the design and the subgrade surfaces in the channel center where the depth is greater than the design surface.
V2L:	The volume of material between the design and the subgrade surfaces of the left bank.
V2R:	The volume of material between the design and the subgrade surfaces of the right bank.
V3:	The volume of material between the subgrade and the supergrade surfaces in the channel center where the depth is less than the design surface.
V3L:	The volume of material between the subgrade and the supergrade surfaces of the left bank.

V3R:	The volume of material between the subgrade and the supergrade surfaces of the right bank.
X2:	The amount of material removed beneath the design surface by a box cut inside the channel toes. You may enter the distance used to consider box cuts.
X1:	The amount of material on the left or right banks that is above the design surface. X1 can be credited to fall into an X2 hole.
Y1:	The amount of material which has been deposited during the dredging process.
Delta:	Predredge – Postdredge of each V value.
TotPay:	Delta + Y1: The quantity of material removed, ignoring areas where the Postdredge profile is above the Predredge profile.

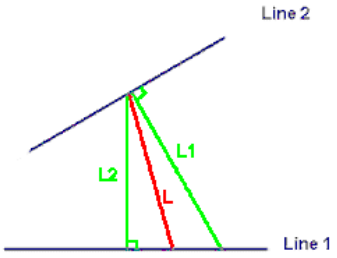
The CROSS SECTION AND VOLUMES program approximates area by interpolating soundings every foot (or meter) along the survey line, then summing distances to the template across the entire line.

After end areas are calculated for adjacent lines, volumes can be calculated. Where survey lines are parallel and the same length, the volume is simply the average of the two end areas times the separation distance.

Where survey lines are not parallel the calculations are more complex because the distance between lines is not constant. In this case, HYPACK® calculates the distance between two survey lines in the following manner:

1. Measures the length of a line drawn perpendicular to Line 1 and extending to Line 2.
2. Measures the length of a line drawn perpendicular to Line 2 and extending to Line 1.
3. Averages the two distances.

FIGURE 7-2. *Calculating Distance Between Survey Lines*



A separate L-value is calculated for each segment of the channel template (Left Slope, Center Channel and Right Slope).

BEWARE! Where adjacent survey lines are not parallel. HYPACK® may not always calculate a separation distance that accurately represents your channel. This could significantly affect your volumes calculations.

We recommend that you check the Distance Between Segments values for those segments in the volumes report. If they are inappropriate to your segment, you can decide on a better value and manually recalculate the volumes for that segment.

The advantage of this method is its simplicity. It is possible to hand-calculate volumes from cross section plots for comparison with the computer results. It is also very fast.

Contour dredging is the case when dredging is payable only where the bottom is above design grade (within project depth contours).

Predredge vs Postdredge is a comparison between predredge and postdredge surveys.

Center line Reference: Methods that use the channel center line as a zero reference measure cross channel distance negative to the left and positive to the right. Methods that do not use the center line as reference measure distance positive from the beginning of the planned line.

Grades: All methods support two grades: the design grade (at project depth) and a subgrade (overdredge limit). Some methods support a third grade below the sub-grade. We call this the supergrade. This is sometimes used as an advance maintenance limit.

Segments: The CROSS SECTION AND VOLUMES program breaks a channel into segments across its width. Three segments are used to calculate volumes separately within the channel (1 segment), and outside the left and right toes (2 segments). The methods that use four segments break the channel into areas left and right of the center line . When turning basins are included, up to eight segments is required. Calculation methods with varying numbers of segments in their templates calculate one volume for each line.

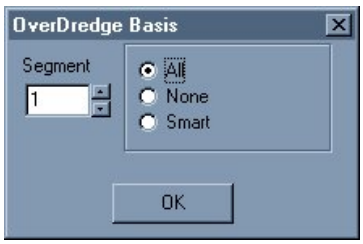
Fill Values calculates fill quantities in addition to dredge (cut) quantities.

STANDARD HYPACK® VOLUMES CALCULATION

The Standard HYPACK® method is, by far, the most flexible of all of the methods. It calculates fill values, allowing it to be used to calculate the capacity of a dumping area, or the volume of sand required for each replenishment. It supports up to 20 segments, making it the only method that allows for sloping turning basins. The Standard HYPACK®method also does a good job where you are using non-parallel survey lines.

The Standard method allows overdredge calculations to differ between segments. From the GRAPH OPTIONS window, Volumes Tab, click on [Overdredge Basis].

FIGURE 7-3. *Overdredge Bases*

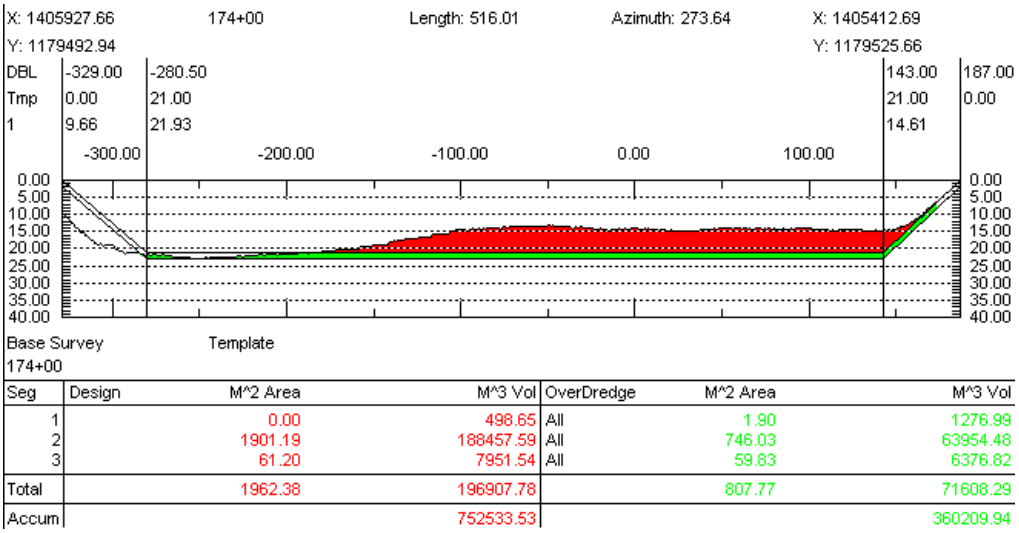


You can choose a different overdredge basis for each segment. Set the segment number, then the overdredge basis for each segment and click [OK].

The overdredge bases are:

- **Smart** for contour dredging
- **All** to include all overdredge material
- **None** to exclude all overdredge material

FIGURE 7-4. *Standard HYPACK Diagram*



Seg	Design	M^2 Area	M^3 Vol	OverDredge	M^2 Area	M^3 Vol
1		0.00	498.65	All	1.90	1276.99
2		1901.19	188457.59	All	746.03	63954.48
3		61.20	7951.54	All	59.83	6376.82
Total		1962.38	196907.78		807.77	71608.29
Accum			752533.53			360209.94

FIGURE 7-5. *A Segment of a Standard HYPACK® Report*

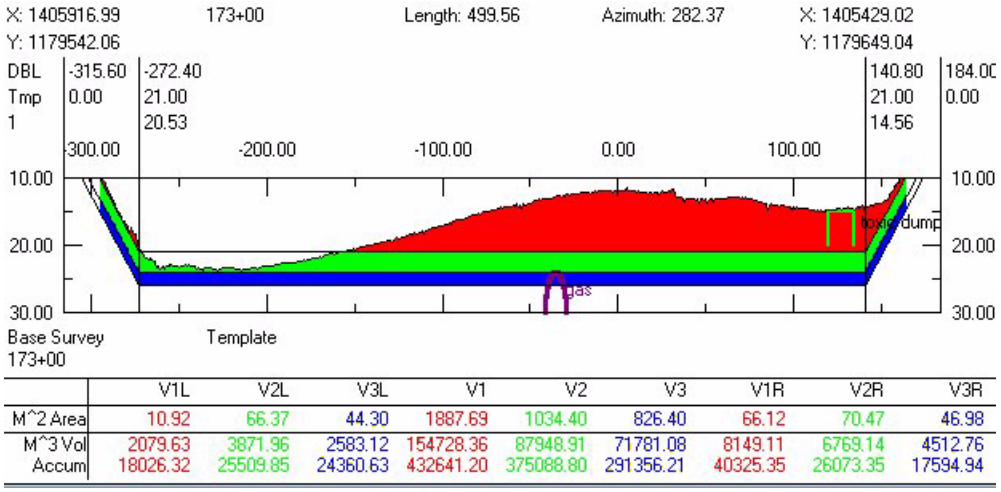
```
Volume Report Plan: 168_aft.css    Method: Standard Hypack 1/13/00 11
Areas: Sq Meters, Volumes: Cu Meters


Volume Summary:

          _____Design_____   ___OverDredge___
Segment       Cut      Fill       Cut      Fill
_____________________________________________________
1         37605.9 210126.1       0.0 163675.8
2        103692.6 270635.1 195040.4  49305.4
3          6601.1 178648.2       0.0 139416.8
_____________________________________________________
Total:   147899.6 659409.5 195040.4 352398.0


Line 1 Data File: 168p00.a28
Template:     SubGrade: 1.0

                 _____Design_____           ___OverDredge___
Seg              Area   Volume OD          Area   Volume
_____________________________________________________________
1      Cut:       4.1      0.0 None
2      Cut:      14.8      0.0 Smart       17.8      0.0
3      Cut:      47.7      0.0 None
_____________________________________________________________
     Total:      66.6      0.0             17.8      0.0


_____________________________________________________________
1     Fill:     197.6      0.0            155.7      0.0
2     Fill:     118.5      0.0             13.3      0.0
3     Fill:     126.6      0.0             94.9      0.0
_____________________________________________________________
     Total:     442.8      0.0            263.9      0.0
```

END AREA 1 VOLUMES CALCULATION

The End Area 1 Method uses a third grade, called supergrade. It is used in addition to the two (design and subgrade) supported by all methods.

This method calculates volumes above each of the three grades within each of the three segments.

FIGURE 7-6. *End Area 1 Diagram*



	V1L	V2L	V3L	V1	V2	V3	V1R	V2R	V3R
M^2 Area	10.92	66.37	44.30	1887.69	1034.40	826.40	66.12	70.47	46.98
M^3 Vol	2079.63	3871.96	2583.12	154728.36	87948.91	71781.08	8149.11	6769.14	4512.76
Accum	18026.32	25509.85	24360.63	432641.20	375088.80	291356.21	40325.35	26073.35	17594.94

FIGURE 7-7. *End Area 1 Report Segment*

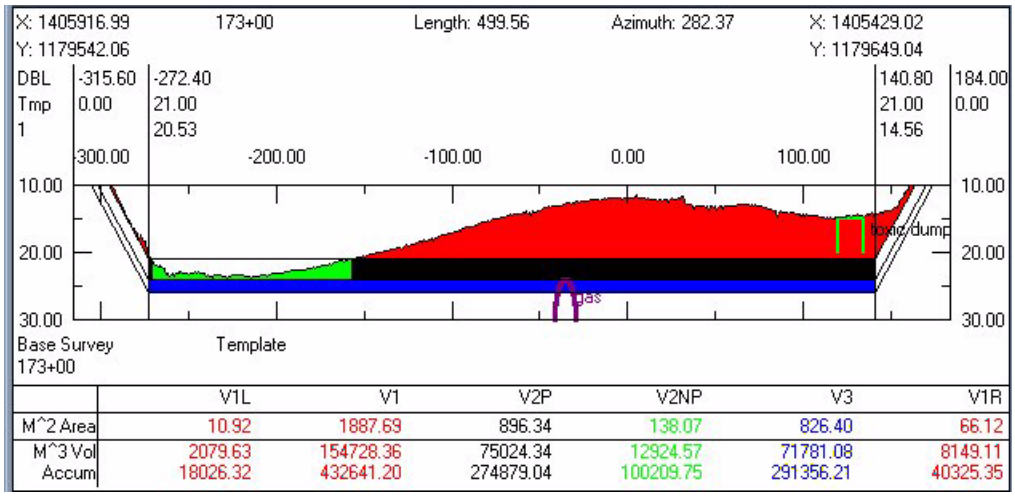
```
Volume Report Plan: 168.css Method: End Area 1 3/23/99 11:41:06 AM
Areas: Sq Meters, Volumes: Cu Meters


Volume Summary:

  V1L:  81056.6   V2L: 145636.8   V3L: 145435.8
   V1:2877445.7    V2:2391109.0    V3:1663874.9
  V1R: 112264.6   V2R: 148124.9   V3R: 122741.5

Total:3070766.9 Total:2684870.7 Total:1932052.1


Line 1        Data File: 168p00.be2
Template:     SubGrade: 3.0 SuperGrade: 2.0

            V1L      V2L      V3L       V1       V2       V3      V1R      V2R      V3R
 Area:      0.5     16.7     27.4     96.4    381.3    364.4     28.2     70.9     51.5

Line 2        Data File: 169p00.be2
Template:     SubGrade: 3.0 SuperGrade: 2.0
Distance Between Segments - Left:     100.0 Center:     100.0 Right:     100.0

            V1L      V2L      V3L       V1       V2       V3      V1R      V2R      V3R
 Area:      6.8     48.1     80.2    318.1    597.4    468.6     93.5     52.3     34.9
  Vol:    362.0   3240.0   5378.6  20731.1  48951.5  41663.7   6086.4   6165.8   4323.2
```

END AREA 2 VOLUMES CALCULATION

This method includes the following volumes as defined above:

- V1L
- V2P
- V1
- 2NP
- V1R
- V3

FIGURE 7-8. *End Area 2 Diagram*



	V1L	V1	V2P	V2NP	V3	V1R
M^2 Area	10.92	1887.69	896.34	138.07	826.40	66.12
M^3 Vol	2079.63	154728.36	75024.34	12924.57	71781.08	8149.11
Accum	18026.32	432641.20	274879.04	100209.75	291356.21	40325.35

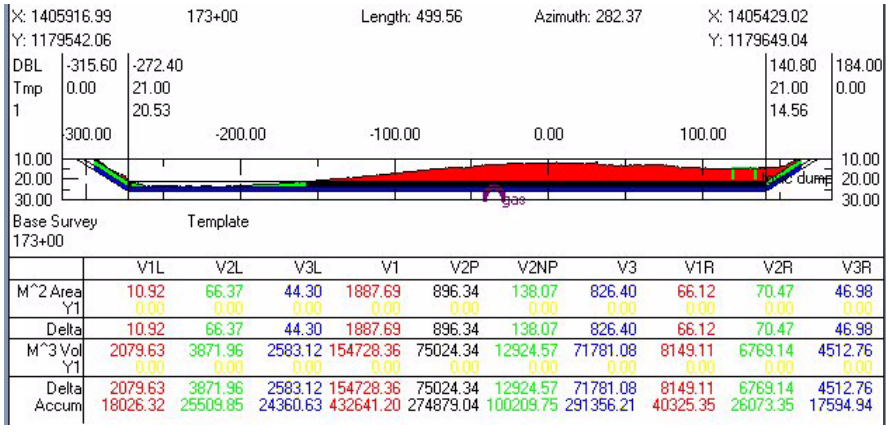
FIGURE 7-9. *End Area 2 Report (Segment)*

```
Volume Report Plan: 168.css Method: End Area 2 3/23/99 11:44:58 AM
Areas: Sq Meters, Volumes: Cu Meters


Volume Summary:

  V1L:  81056.6   V2P:2207287.3    V3:1663874.9
   V1:2877445.7  V2NP: 183821.7
  V1R: 112264.6

Total:3070766.9 Total:2391109.0 Total:1663874.9


Line 1        Data File: 168p00.be2
Template:     SubGrade: 3.0 SuperGrade: 2.0

            V1L       V1      V2P     V2NP       V3      V1R
 Area:      0.5     96.4    183.8    197.5    364.4     28.2

Line 2        Data File: 169p00.be2
Template:     SubGrade: 3.0 SuperGrade: 2.0
Distance Between Segments - Left:     100.0 Center:     100.0 Right:     100.0

            V1L       V1      V2P     V2NP       V3      V1R
 Area:      6.8    318.1    373.9    223.5    468.6     93.5
  Vol:    362.0  20731.1  27895.1  21056.4  41663.7   6086.4
```

END AREA 3 VOLUMES CALCULATION

Load pre-dredge data as your base survey and post-dredge data in the first overlay column. The V1,V2 and V3 values from methods 1 and 2 are included in the report as well as X1, X2 and Y1 values. Comparative differences are calculated.

FIGURE 7-10. *End Area 3 Diagram*



	V1L	V2L	V3L	V1	V2P	V2NP	V3	V1R	V2R	V3R
M^2 Area	10.92	66.37	44.30	1887.69	896.34	138.07	826.40	66.12	70.47	46.98
Y1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Delta	10.92	66.37	44.30	1887.69	896.34	138.07	826.40	66.12	70.47	46.98
M^3 Vol	2079.63	3871.96	2583.12	154728.36	75024.34	12924.57	71781.08	8149.11	6769.14	4512.76
Y1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Delta	2079.63	3871.96	2583.12	154728.36	75024.34	12924.57	71781.08	8149.11	6769.14	4512.76
Accum	18026.32	25509.85	24360.63	432641.20	274879.04	100209.75	291356.21	40325.35	26073.35	17594.94

FIGURE 7-11. *End Area 3 Report (Segment)*

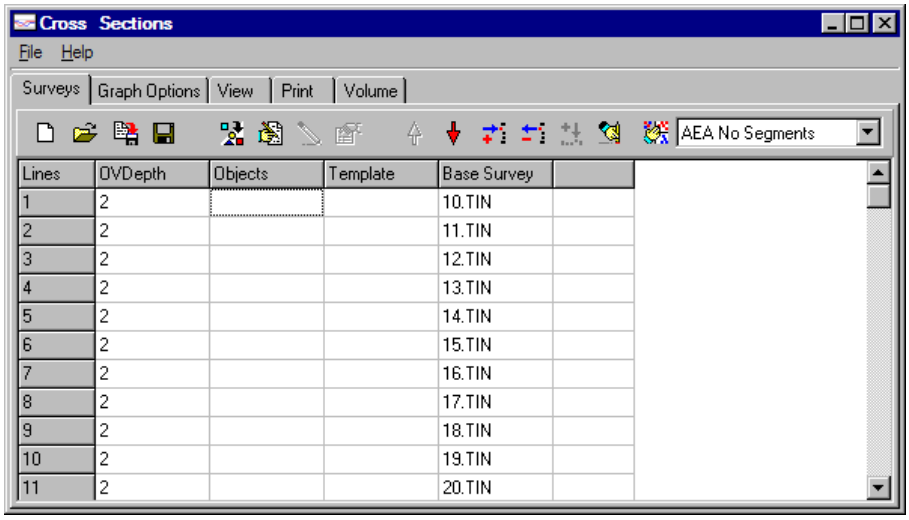
```
Volume Report Plan:  Method: End Area 3 9/21/2004 1:45:35 PM
Areas: Sq Meters, Volumes: Cu Meters


Volume Summary:

  DV1L:   55454.29  DV2L:   52484.38  DV3L:   14117.32   X1L: 102301.29   X1R:   45818.26    Y1: 72147.04
   DV1:3043129.91  DV2P: 473566.50   DV3:    1028.22  DX2L:       0.00  DX2R:       0.00
  DV1R: 117797.81 DV2NP: -10518.06  DV3R:   26203.58
                   DV2R: 108135.04
_____________________________________________________
 Total:3216382.01         623667.85          41349.12


Line 1 Pre-Dredge File: 168p00.be2 Post-Dredge File: 168p00.a28
Template:  SubGrade: 3.00 SuperGrade: 1.00
LTOB: -87.20 LToe: -39.10 RToe: 143.10 RTOB: 185.10
Depth at Center: 21.00

   Area       V1L    V2L    V3L      V1     V2P     V2NP      V3     X2L     X2R     V1R     V2R     V3R
_____________________________________________________________________________________________________
     Y1      2.78   7.80   2.88   10.27    0.00    37.77    0.00    0.00    0.00   47.72   31.02   13.04
_____________________________________________________________________________________________________
    Pre      1.35  20.17  13.45  123.38  229.06   202.87  182.20    0.00    0.00   32.92   73.82   25.77
   Post      4.13  27.96  16.34   14.77  193.45   234.65  182.20    0.00    0.00   47.72   37.59   20.35
_____________________________________________________________________________________________________
  Delta     -2.78  -7.80  -2.88  108.61   35.62   -31.78   -0.00    0.00    0.00  -14.81   36.23    5.43
 TotPay      0.00   0.00   0.00  118.88   35.62     5.99    0.00    0.00    0.00   32.92   32.92   18.47
     X1                                                             27.96   37.59
```

END AREA VOLUMES WHEN TEMPLATES HAVE DIFFERENT NUMBERS OF SEGMENTS

In previous releases of HYPACK®, the CROSS SECTIONS AND VOLUME (CSV) program had the restriction that each cross section template had to have the same number of template points. As you came across turning basins or multiple side slopes, this often required 'tricking' the program by adding 'null' points along templates so that they all had the same number of points.

As dredging projects continue to increase in complexity, we have been working on automatically generating templates that accurately reflect the digging plan. We have also modified CROSS SECTIONS AND VOLUMES so that it can compute a volume quantity when it encounters templates with different numbers of segments.

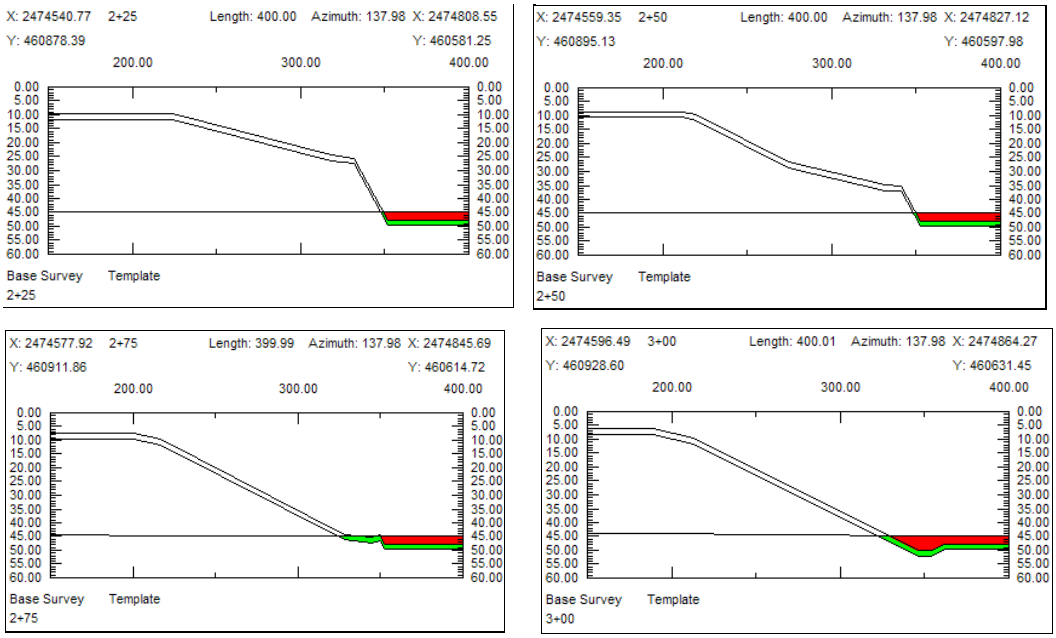
FIGURE 7-12. *Average End Area with No Segments--Survey Tab*



In the "AEA No Segments" method, the program will compute the entire area above the design template and the overdepth, regardless of the number of points used to define the channel template. The total area for each pair of lines is then used to compute the volume of material between each pair.

Sample sections are shown below. Any material above the design template is shown in red.

FIGURE 7-13. *Sections 1 (Top Left), 2 (Top Right), 3 (Lower Left) and 4 (Lower Right)*



In the resulting Volume Report, for each survey section, you get the total area above the template, the volume back to the previous section and the accumulated volume through the channel to that point.

FIGURE 7-14. *Sample AEA No Segments Report*

Volume Report Plan: Method: Average End Area No Segments 12/13/2006 10:2
Areas: Sq Feet, Volumes: Cu Yards

Section	V1 Area	V1 Vol	V1 Accum Vol	V2 Area	V2 Vol	V2 Accum Vol
2+25	133.21	0.00	0.00	102.95	0.00	0.00
2+50	132.24	122.90	122.90	102.24	95.00	95.00
2+75	132.80	122.69	245.60	141.65	112.90	207.90
3+00	225.65	165.96	411.56	150.07	135.07	342.97
3+25	269.98	229.47	641.03	155.03	141.26	484.23
3+50	271.85	250.83	891.85	156.27	144.11	628.34
3+75	272.52	252.00	1143.86	156.84	144.95	773.29
4+00	273.16	252.65	1396.50	157.45	145.51	918.81
4+25	273.79	253.23	1649.73	158.02	146.06	1064.86
4+50	274.41	253.81	1903.55	158.66	146.62	1211.48
4+75	275.07	254.37	2157.91	159.23	147.16	1358.64
5+00	275.74	254.99	2412.90	159.80	147.69	1506.33
5+25	275.95	255.43	2668.32	160.08	148.10	1654.44
5+50	274.86	255.02	2923.35	159.34	147.89	1802.33
5+75	273.75	253.97	3177.31	158.66	147.21	1949.55
6+00	272.71	253.01	3430.32	157.93	146.58	2096.13
6+25	271.49	251.92	3682.24	157.18	145.87	2242.00
6+50	269.77	250.59	3932.84	156.37	145.17	2387.18
6+75	269.39	249.59	4182.43	155.68	144.46	2531.63
7+00	249.25	240.09	4422.52	139.35	136.58	2668.21

PHILADELPHIA VOLUMES CALCULATION

The **Philadelphia Predredge** method calculates volumes between a survey depth and the channel template.

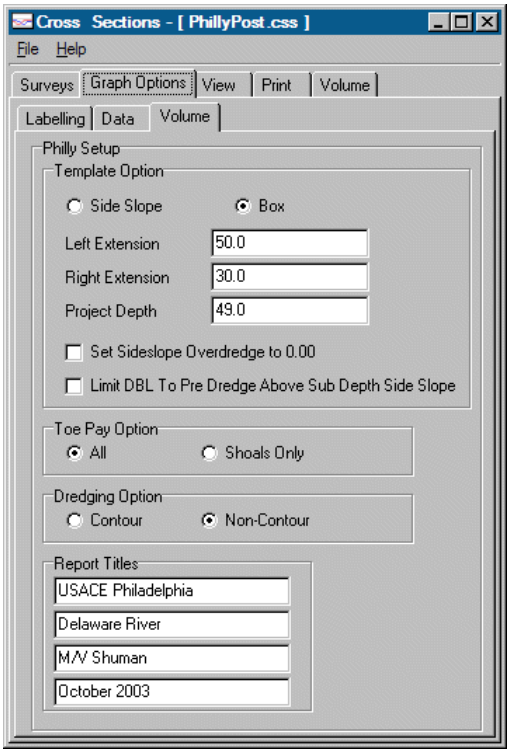
The **Philadelphia Postdredge** method calculates the difference in volumes between two surveys of the same area.

These methods are unique in how they handle calculating volumes of the overdredge material. They also provide choices:

- to use the channel template or to create a box template.
- to calculate or omit the overdredge in the side slope/box extension by setting it to zero.

These options are defined in the Graph Options-Volumes Tab.

FIGURE 7-1. *Philadelphia Setup in the Graph Options-Volumes Tab*



SIDE-SLOPE TEMPLATE VOLUMES CALCULATIONS

The Side Slope Option uses the standard side slopes from the channel template.

The **Dredging Option** must be specified with this option.

Non-Contour includes all overdredge material. It is overridden in the extension areas by the Shoals Only Toe Pay option.

Contour includes overdredge material only if the depth is less than the channel depth. Contour overrides the All Toe Pay option in the extension areas.

The following diagrams show the difference.

FIGURE 7-2. Side Slope Non-Contour

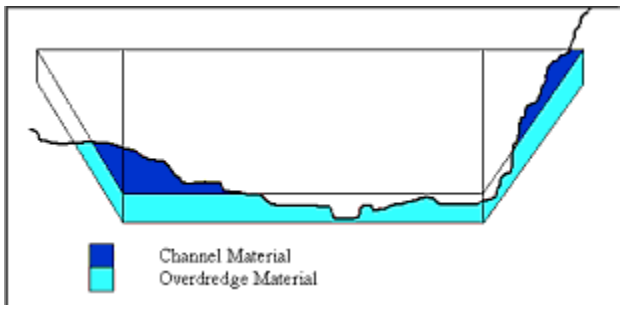
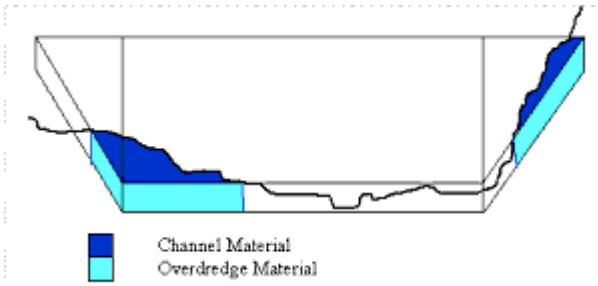


FIGURE 7-3. Side Slope Contour



Set Side slope Overdredge to 0.00 omits overdredge material in the side slope areas.

Limit DBL to Pre-Dredge Above Sub-Depth Side Slope performs the computation of infill and overdredged material only inward from the points where the pre-dredge survey passes through the overdepth template.

BOX TEMPLATE VOLUMES CALCULATIONS

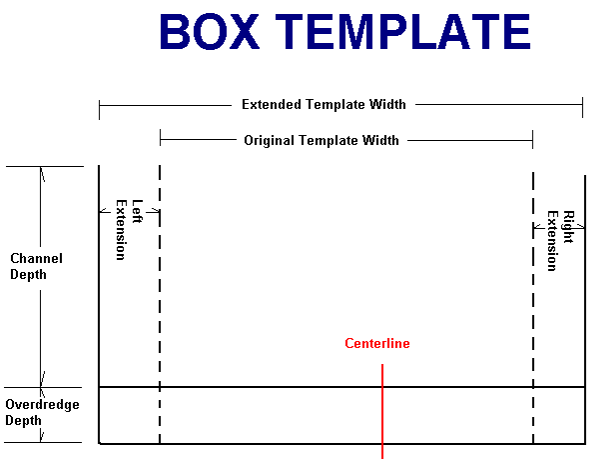
A box template uses the channel template center channel information but omits the side slopes and places vertical lines from the toes.

You can extend the box template in the Graph Options-Volumes Tab. Extend the sides by entering left and right extensions.

NOTE: CROSS SECTIONS AND VOLUMES calculates volumes only to the top of bank position. Therefore, the extensions must remain within the bounds of the tops of the banks.

The project depth may be increased by entering a project depth greater than the template depth. (If the project depth in the Philly setup is less than the channel template depth, the program will use the channel template depth.) The Above Channel and Overdredge volumes will then be calculated for each segment (Left and Right Extensions, Left and Right of Center line).

FIGURE 7-4. The Box Template in the Philadelphia method



Volumes calculations using the box template will be affected by both the Toe Pay and Dredging Options.

Toe Pay affects volumes calculations of overdredge material in the extension areas only.

- **All** includes all of the overdredge material in the extension areas. Contour overrides All in the extension areas.
- **Shoals Only** includes overdredge material in the extension area only if the depth at the toe line is less than the channel depth. Shoals Only overrides the Non-contour option.

Figure 7-5through Figure 7-7 on page 69 illustrate how the Toe Pay and Dredging Options affect each other.

FIGURE 7-5. Non-Contour Dredging with All Toe Pay Option

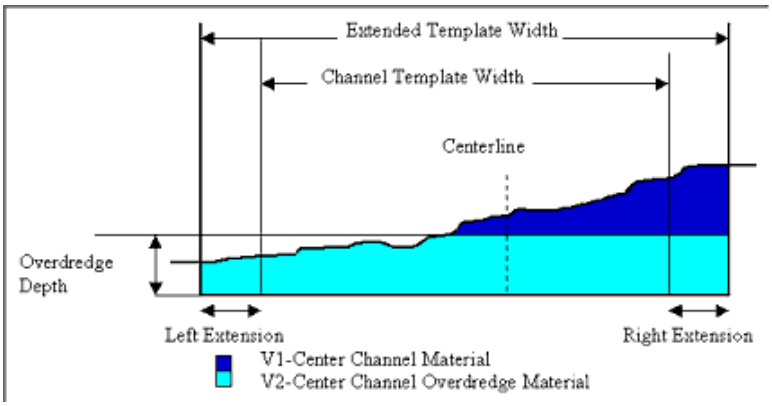


FIGURE 7-6. *Non-Contour Dredging with Shoals Only Toe Pay Option*

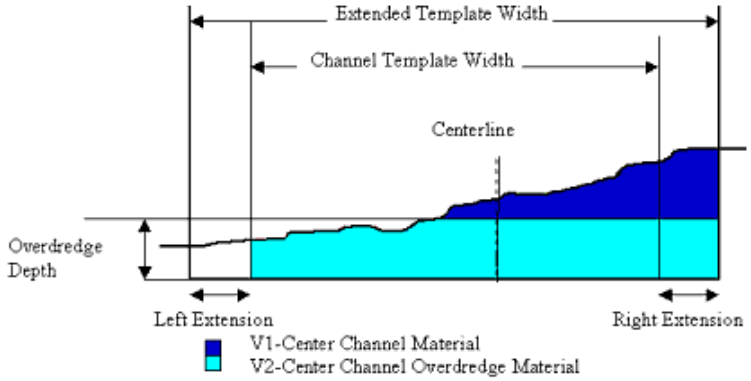
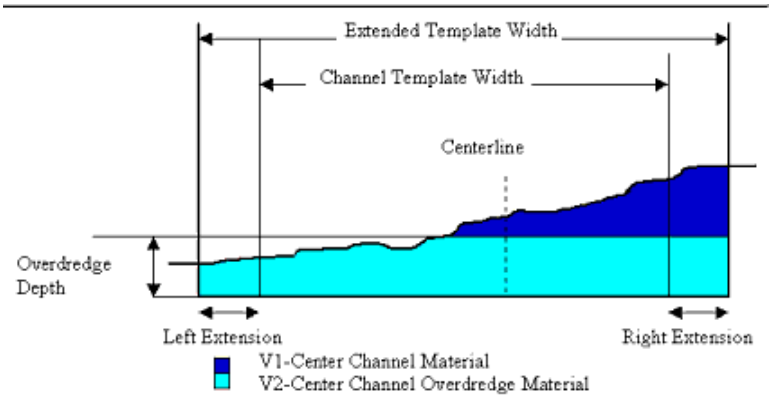


FIGURE 7-7. *Contour Dredging Option*



The volumes calculations may be displayed in the legend in the View Tab and in the Volumes Report displayed in the Volumes Tab. The Offsets value is the distance from the center line to the toe and end of each extension.

•

FIGURE 7-8. *Volumes displayed in the legend of the View Tab*

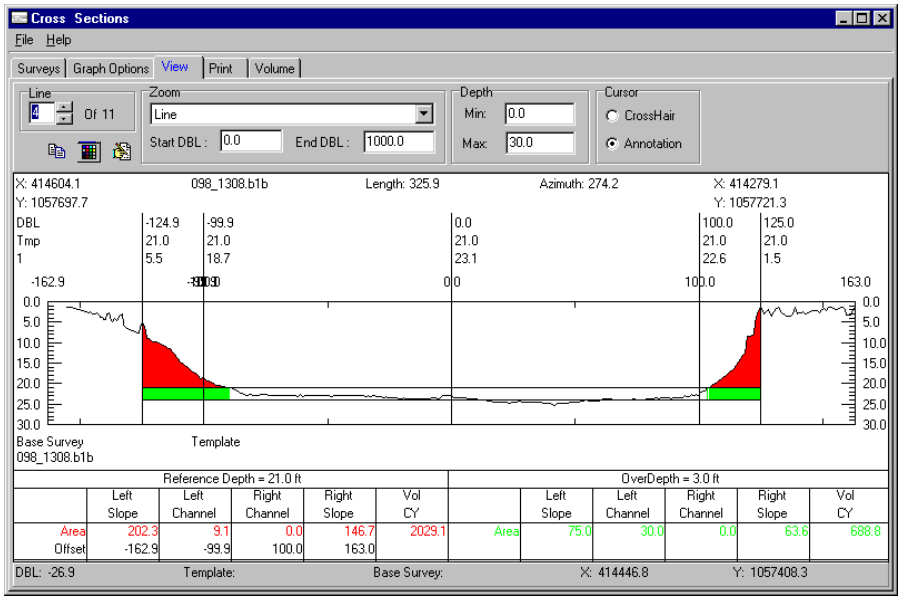


FIGURE 7-9. *Sample Philadelphia Report*

```
                    Project      Over      Left      Right
Station To Station    Depth     Depth     Slope     Slope
095_1303.B1B105_1318.blb      21.0      24.0       0\0       0\0

        Dredging Quantities Summary
        ===========================
 Total Material To Project Depth .....    9833.3 CY
 Total Allowable Overdepth ...........    4231.5
 Total Pay Place .....................   14064.7

    Dredging Quantities Computation
    ===============================

         -------- Reference Depth =     21.0 ft ------          ------------ Overdepth =      3.0 ft --------
              Left      Left     Right     Right   Volume              Left      Left     Right     Right   Volume
Station        Box   Channel   Channel       Box     (CY)               Box   Channel   Channel       Box     (CY)
             ----      ----      ----      ----     ----              ----      ----      ----      ----     ----
095_1303.B1B      0.0       0.0       0.0      95.7                      0.0       0.0       0.0      58.3
   Offset    -124.9    -99.9     100.0     125.0

096_1305.b1b      0.0      78.2       0.0      53.9    422.0              0.0      52.4       0.0      36.4    272.3
   Offset    -124.9    -99.9     100.0     125.0

097_1306.b1b    414.8     212.4       0.0     110.4   1610.7             64.5      86.6       0.0      52.2    540.8
   Offset    -124.9    -99.9     100.0     125.0
```

BEACH VOLUMES

Beach volumes are used for beach reclamation projects. Typically, you will have All format survey data as close to the beach as you can get with your survey vessel, and additional XYZ data gathered on land. To be loaded to CROSS SECTIONS AND VOLUMES, these data sets must be merged and converted to HYPACK® All format files.

To merge the datasets:

1. **Load both datasets to the EXPORT program** and export them to XYZ format.
2. **Load the XYZ data with a 3-dimensional planned line file of your survey area to the REMAP program** and export the merged dataset as an All format file.

There are two calculation methods for beach volumes:

- The **Beach Pre-dredge** method calculates how much material must be added to bring the profile up to the template.
- The **Beach Post-dredge** method calculates how much material has been added beneath the design template between two surveys. It also reports how much material needs to be added to bring the post-dredge Survey up to the design template.

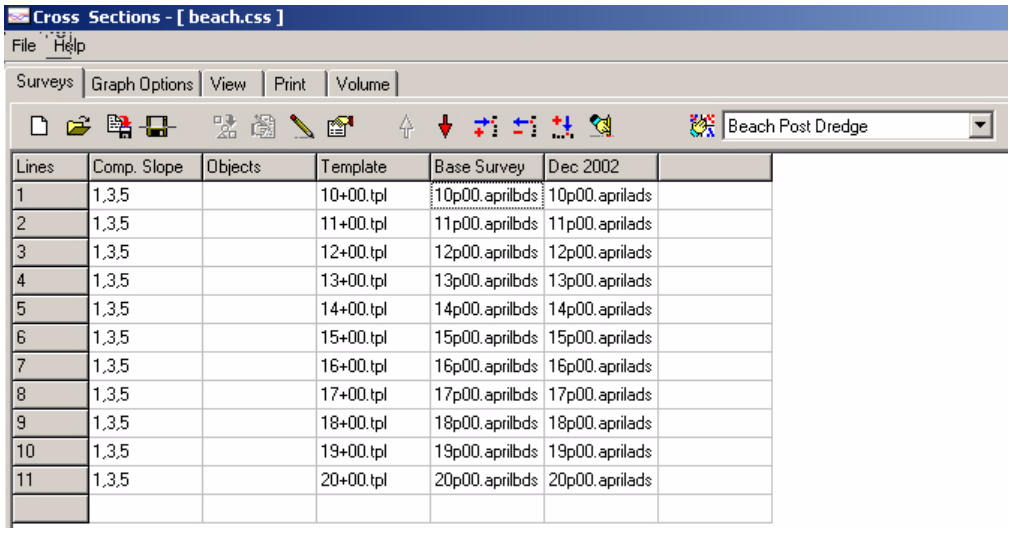
COMPENSATING SLOPES

The Survey tab for both the Beach Pre-dredge and Beach Post-dredge methods includes a 'Compensating Slopes' column. When the compensating slope calculation is enabled for a segment, material that is above the template is credited against areas where the material is below the template, provided that area is 'downhill' from the credit material.

NOTE: Compensating slopes are not valid on horizontal segments (no slope).

To enable compensating slopes, enter the template segment numbers (beginning from the left end of the template) as a comma-delimited list in the Comp. Slope column. In the following example, compensating slope calculations are enabled for segments 1, 3, and 5 of each template.

FIGURE 7-10. *Specifying Compensating Slopes in CROSS SECTIONS AND VOLUMES*



Lines	Comp. Slope	Objects	Template	Base Survey	Dec 2002
1	1,3,5		10+00.tpl	10p00.aprilbds	10p00.aprilads
2	1,3,5		11+00.tpl	11p00.aprilbds	11p00.aprilads
3	1,3,5		12+00.tpl	12p00.aprilbds	12p00.aprilads
4	1,3,5		13+00.tpl	13p00.aprilbds	13p00.aprilads
5	1,3,5		14+00.tpl	14p00.aprilbds	14p00.aprilads
6	1,3,5		15+00.tpl	15p00.aprilbds	15p00.aprilads
7	1,3,5		16+00.tpl	16p00.aprilbds	16p00.aprilads
8	1,3,5		17+00.tpl	17p00.aprilbds	17p00.aprilads
9	1,3,5		18+00.tpl	18p00.aprilbds	18p00.aprilads
10	1,3,5		19+00.tpl	19p00.aprilbds	19p00.aprilads
11	1,3,5		20+00.tpl	20p00.aprilbds	20p00.aprilads

Varying Template Segment Numbers

Both the Beach Pre-dredge and Beach Post-dredge methods support profile lines with varying numbers of design template points. CROSS SECTIONS AND VOLUMES computes the entire area under each template then the entire volume quantity for each pair of profile lines. Since we chose to support design templates with differing number of template points, the volume quantities cannot be broken into segments.

Volumes for Minimum and Maximum Template Depths

In the Graph Options-Volumes tab, you can elect to compute the volume quantities for a 'Maximum Design Template' and a 'Minimum Design Template'. These are templates that are offset vertically by user-specified distances from the Design Template.

In the following example, we have set a Maximum Design Template to be 0.5' above the Design Template and a Minimum Design Template to be 1.0' beneath the Design Template.

FIGURE 7-11. *Beach Volumes Graph Options*

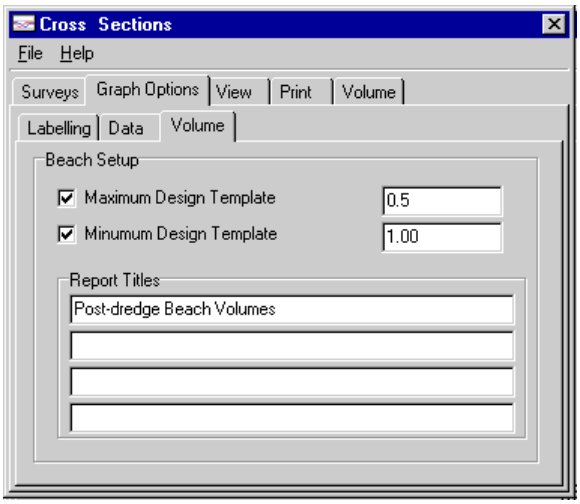
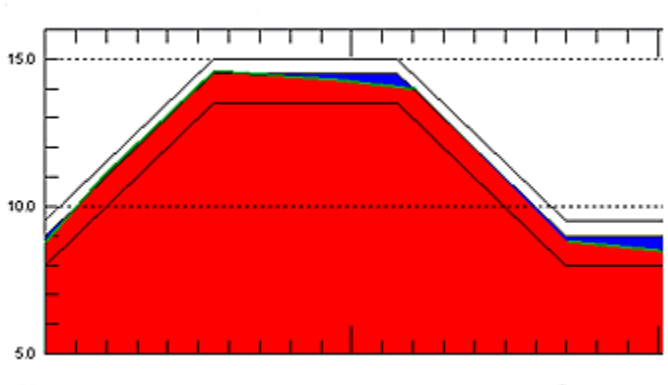


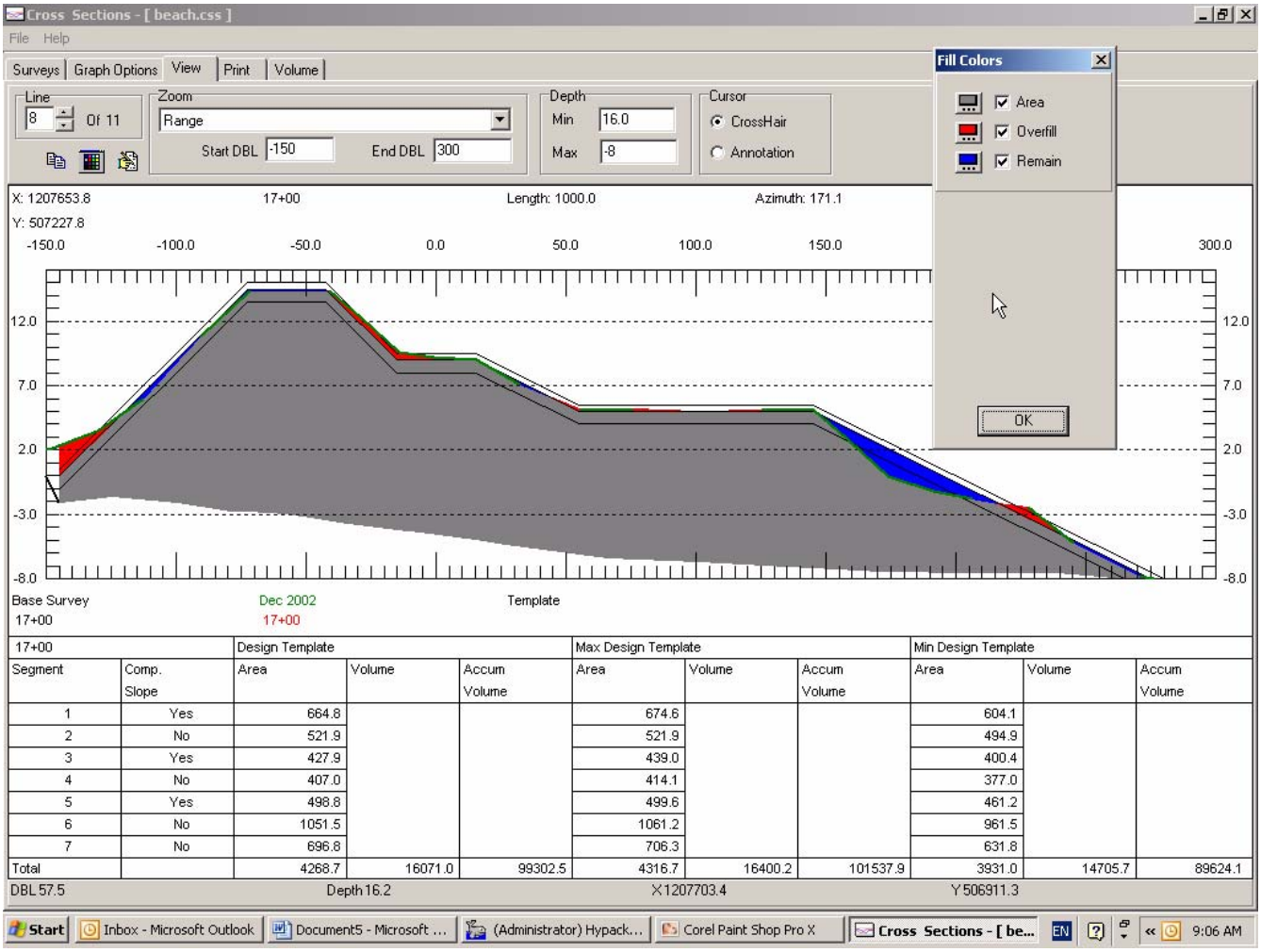
FIGURE 7-12. *Maximum Template 0.5 above and Minimum Template 1.0 below the Design Template*



CROSS SECTIONS AND VOLUMES calculates the volume quantity for each template separately. The Volume Report will have a section displaying the areas and volumes for each template.

The View Tab shows the resulting display of a Beach Post-dredge computation.

FIGURE 7-13. *Sample Beach Post-dredge Survey Tab*



The Pre-Dredge survey profile is shown as the bottom border of the gray area. The Post-Dredge survey profile is shown as a green line.

In the previous example, material has been color-coded:

Gray	Material added up to the Design Template.
Red	Material added above the Design Template.
Blue	Material that needs to be added to bring the Post-Dredge profile up to the Design Template.

The legend beneath the graph provides the Compensating Slope status, and area of material for each segment of the current profile. It also shows

the Total Volume from the previous section and the Accumulated Volume up to the currently displayed line in the channel.

All of these items are duplicated when the user prints/plots the profiles.

The Volume Report for the Beach methods provides a section for the Design Template and, optionally, for the Minimum Design Template and Maximum Design Template.

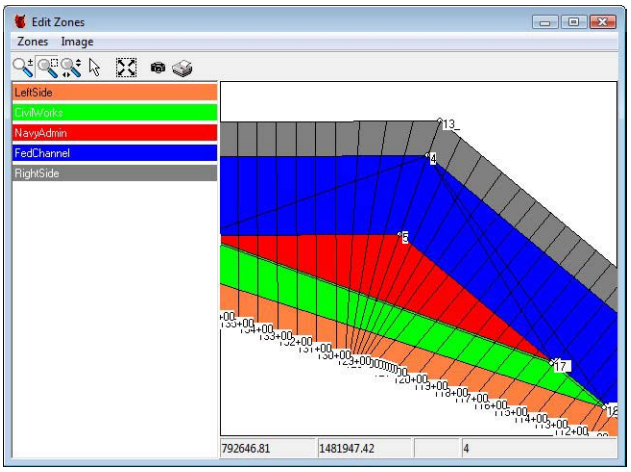
NOTE: Get yourself a WIDE printer!

VOLUMES BY ZONE IN CROSS SECTIONS AND VOLUMES

Volume zones are user-defined areas of channel templates generated in ADVANCED CHANNEL DESIGN. They are useful for volumes calculations in projects with complex channel designs.

Before you begin in CROSS SECTIONS AND VOLUMES, you must first generate your channel file (*.CHN) and a zone edge listing (*.ZEL) in ADVANCED CHANNEL DESIGN.

FIGURE 7-14. *Zones and Planned Lines displayed in ADVANCED CHANNEL DESIGN*



The **zone edge listing (*.ZEL)** file is an ASCII text file that contains a listing of where each line crosses each zone boundary and each inflection point of the model within a zone boundary. CROSS SECTIONS AND VOLUMES reads the ZEL file for the template information and generates volume quantities based on that listing.

In the CROSS SECTIONS AND VOLUMES, Survey tab:

- **Select the calculation method.**
  - For a single survey, select the **Zone Listing Predredge** method.
  - For a post-dredge comparison, select the **Zone Listing Postdredge** method.
- **Load your survey data** to the Base Survey column.

- **Fill the Template column with your ZEL file**. (Load it into the top cell of the column and click the Fill Column icon.)

When the information is complete in the Survey tab, you can view the channel profiles in the View tab and the volumes calculations in the Volume tab.

The volume report lists the totals for each design area (top) in the summary. It provides both the Overdepth and the Contour Overdepth quantities. It then lists the area, volume for each section, and the accumulated volume for the different zones throughout the report.

FIGURE 7-15. *Sample Volume Report*

```
Volume Report Plan:  Method: Zone Listing 11/13/2008 8:31:49 AM
Areas: Sq Feet, Volumes: Cu Yards

                Design  Overdepth Contour OD
0               4010.2    11962.3     6269.0
1               9484.0    35006.8    17612.8
2                401.5    18152.0     3478.0
3              17459.1   363058.1    91000.6
4               3960.2    17080.6     8577.9
-----------------------------------------------
Totals         35315.0   445259.7   126938.4

01+00                0          1          2          3          4

Design
Area               0.0        0.0        0.0        2.6        0.0

Overdepth
Area               7.8        0.0        0.0      514.0        7.9

Contour Overdepth
Area               0.4        0.0        0.0       56.4        0.0

02+00                0          1          2          3          4
Distance         100.0      100.0      100.0      100.0      100.0

Design
Area               0.0        0.0        0.0        0.2        0.0
Volume             0.0        0.0        0.0        5.2        0.0
Acc Volume         0.0        0.0        0.0        5.2        0.0
```

JACKSONVILLE VOLUMES CALCULATION

The Jacksonville method calculates the void areas, created by box cutting along the toe lines, in order to credit the dredging contractor for the material falling from the side slope into the void.

JACKSONVILLE PRE-DREDGE CALCULATIONS

The Jacksonville Pre-dredge method is another average end area method of volumes calculations with a volumes report customized for the USACE in Jacksonville. Its primary purpose is to provide pre-dredge data for the Jacksonville Post-dredge volumes calculations. For this reason, all of the options in the Graph Options-Volumes tab should be identical for the Pre-dredge and Post-dredge volumes calculations. The only option applicable to the Pre-dredge calculations is whether to include side slope data.

JACKSONVILLE POST-DREDGE CALCULATIONS

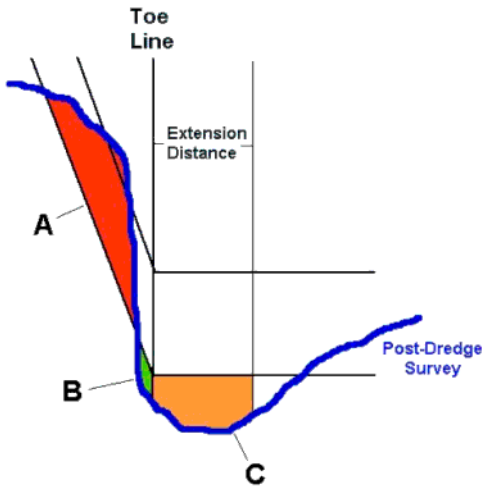
In the Jacksonville Post-dredge method, three volumes are calculated:

A: Material remaining above the overdepth side slope.

B: The void area outward from the toe line until the depth crosses above the overdepth template.

C: The void area inward from the toe line until the depth crosses above the overdepth template *or* until it meets the user-defined Box Cut distance.

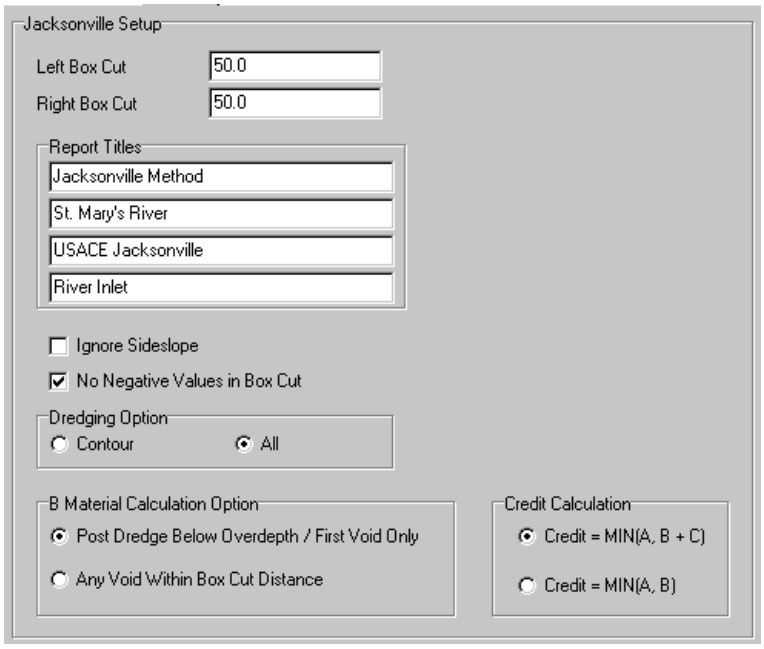
FIGURE 7-1. *Jacksonville Post-Dredge*



For each line, volume of side slope material (A) is compared to the void of the box cut (either B or the sum of B and C as set in the Graph Options) and the contractor is credited for the lesser value.

The Graph Options tab provides several options.

FIGURE 7-2. *Jacksonville Volumes Options*



Box Cuts define the area inward from the toe on which the C calculation is based.

Ignore Side Slope reports '0' material for all side slopes and calculates only center channel volumes.

No Negative Values in Box Cut: If A, B, or C was larger in the Post-Dredge, it is possible to get negative values. If this option is selected, negative values become 0.

Dredging Options:

- **Contour dredging** pays only for material removed where the bottom is above design grade (within project depth contours).
- **All** includes all of the overdredge material.

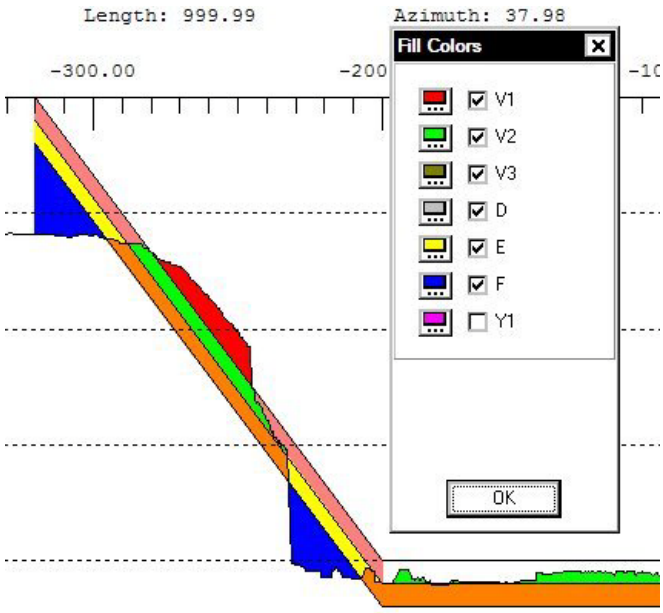
B Material Calculation Option:

- **Post Dredge Below Overdepth/First Void Only:** The program computes a void only if the depth at the toe line is beneath the specified template.
- **Any Void within Box Cut Distance:** When this option is selected, the program uses the X2L and X2R values from the Survey tab and will include any voids outward from the toe line within the specified distance.

Beware!

BEWARE! This can be a little dangerous. If the extension reaches past the top of slope, it can calculate void *above* the V1 material. The V1L material *will not move upward* into the void.

FIGURE 7-3. Under certain conditions, voids above the V1 material may be included.



Credit Calculation Options compare two values and credits the smaller of the two. The first option compares the overdredge volume with the total of B and C. The second option credits the lesser of A and B.

The Post-dredge report contains a summary of the volumes calculated in the header, followed by a line-by-line accounting of the volumes calculated for each segment at design and overdredge depths.

The last section of the report displays:

- The volumes calculated for the side slope materials.
- The voids relating to the box cut.
- The amount credited for each line.

FIGURE 7-4. *Jacksonville Post-Dredge Report*

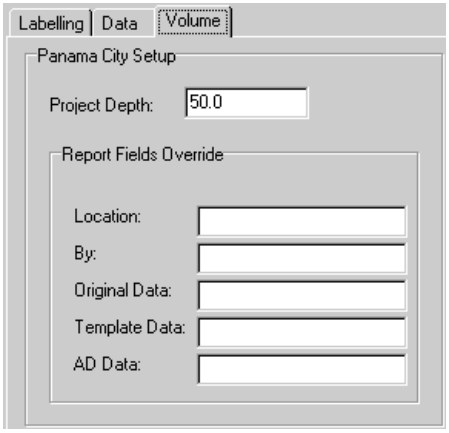
```
Volume Report - Jacksonville Postdredge Method          Plan: JaxPost.css    2/28/2006 1:57:47 PM
Jacksonville Method                                     St. Mary's River
USACE Jacksonville                                      River Inlet


                          Design      Over       Left       Right
      Station To Station  Depth       Depth      Slope      Slope
                          50.0        52.0       2.0/1      2.0/1

      Dredging Quantities Summary
      ===========================
      Total Removed To Design Depth ..... -5310826.3 CM
      Total Removed In Overdepth .........   -191566.5
      Total Allowable Box Cut ............     19339.6
      Total Pay Volume Including Box Cut ... -5483053.2

      Total Remaining Above Design Depth....  9162142.4
      Total Remaining In Overdepth .........   975744.2

      Dredging Quantities Computation
      ===============================

All Overdepth
                  Sideslopes Included                                  Sideslopes Included
              ---------- Design Depth = 50.0 Mt -------     ---- Allowable Overdepth = 2.0 Mt ------
                 Left    Channel      Right     Volume       Left    Channel      Right     Volume
Station         Slope   Area (M)      Slope      (CM)       Slope   Area (M)      Slope      (CM)
              --------   --------   --------   --------   --------   --------   --------   --------

   Removed     -563.2      447.7      277.6                 -41.8        2.6       12.8
    Remain      577.1      266.5        0.0                  60.4      197.4        2.9
    Offset     -150.0  -50     50      150.0

                        Left    Slope                              Right    Slope              Total
 Station         A         B        C    Credit         A         B        C    Credit      Credit
          33557.9       0.0      0.0       0.0     451.1       0.0      0.0       0.0         0.0
           3610.1       0.0      0.0       0.0     347.6       0.0      0.0       0.0         0.0
          88995.6       0.0      0.0       0.0   66215.2       0.0      0.0       0.0         0.0
          93010.5       0.0      0.0       0.0   83325.7       0.0      0.0       0.0         0.0
          39627.1       0.0      0.0       0.0   28260.6       0.0      0.0       0.0         0.0
          59606.7       0.0      0.0       0.0   47813.0       0.0      0.0       0.0         0.0
         153742.4       0.0      0.0       0.0  132071.2       0.0      0.0       0.0         0.0
         166129.1       0.0      0.0       0.0   96456.4       0.0      0.0       0.0         0.0
         139228.3       0.0      0.0       0.0    2742.2       0.0      0.0       0.0         0.0
         108724.5       0.0      0.0       0.0    2075.7       0.0      0.0       0.0         0.0
          21355.7       0.0      0.0       0.0   72483.5       0.0      0.0       0.0         0.0
          18113.3       0.0      0.0       0.0   72090.8   13184.1    365.0   13549.1     13549.1
          37076.5       0.0      0.0       0.0    5790.5   13183.9    365.0    5790.5      5790.5
          36643.5       0.0      0.0       0.0  119577.9       0.0      0.0       0.0         0.0
          69474.7       0.0      0.0       0.0  223718.6       0.0      0.0       0.0         0.0
          68858.4       0.0      0.0       0.0  181098.0       0.0      0.0       0.0         0.0
          83716.0       0.0      0.0       0.0   85094.4       0.0      0.0       0.0         0.0
          96182.7       0.0      0.0       0.0   16079.2       0.0      0.0       0.0         0.0
          19208.5       0.0      0.0       0.0  110567.8       0.0      0.0       0.0         0.0
          14665.2       0.0      0.0       0.0  155607.3       0.0      0.0       0.0         0.0
          15566.5       0.0      0.0       0.0  113513.6       0.0      0.0       0.0         0.0
         124447.7       0.0      0.0       0.0   83611.4       0.0      0.0       0.0         0.0
         211861.5       0.0      0.0       0.0   77920.9       0.0      0.0       0.0         0.0
         164992.1       0.0      0.0       0.0   60640.0       0.0      0.0       0.0         0.0
          77991.8       0.0      0.0       0.0   68001.4       0.0      0.0       0.0         0.0
          60162.5       0.0      0.0       0.0   72824.3       0.0      0.0       0.0         0.0
         116245.8       0.0      0.0       0.0    6416.9       0.0      0.0       0.0         0.0
         105938.7       0.0      0.0       0.0   54605.4       0.0      0.0       0.0         0.0
         149348.4       0.0      0.0       0.0  201689.0       0.0      0.0       0.0         0.0
         112808.3       0.0      0.0       0.0  189552.0       0.0      0.0       0.0         0.0
         --------  --------  --------  --------  --------  --------  --------  --------  --------
Total                                      0.0                                 19339.6     19339.6
```

PANAMA CITY VOLUMES CALCULATION

Panama City calculations use average end area method to compare pre-dredge and post-dredge survey data and reports the results on the Government Engineering Form 80.

The Graph Options enable you to quickly revise the survey information listed in the report header or modify the project depth.

FIGURE 7-5. *Panama City Graph Options*



In the View Tab, you can set a fill color for the void areas below the deepest template.

FIGURE 7-6. *Panama City View Tab*

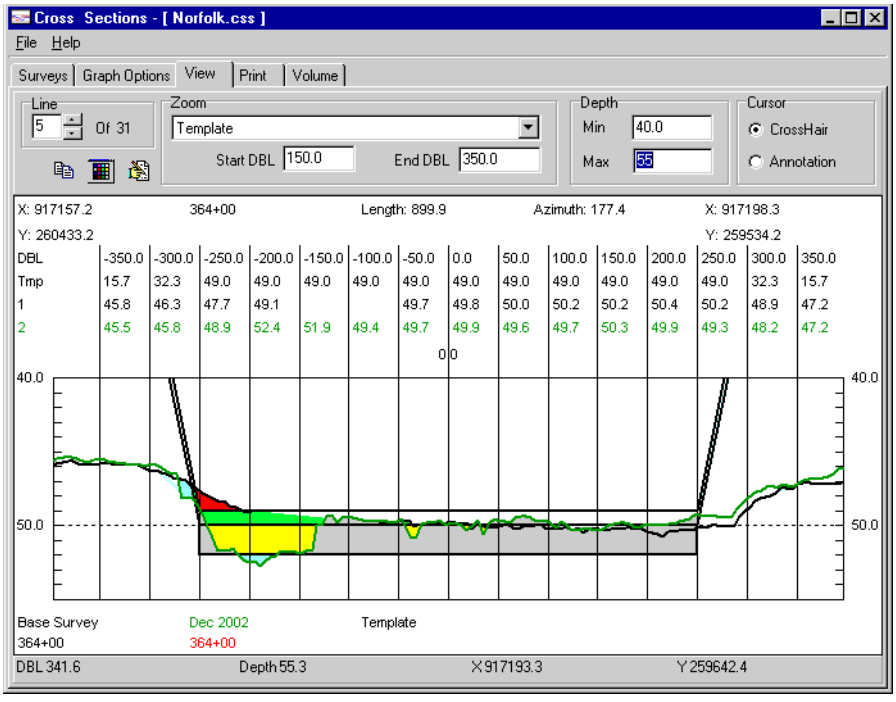


FIGURE 7-7. *Panama City Report*

SUMMERY OF VOLUME COMPUTATIONS 3/9/2005 3:52:13 PM
LOCATION: MAINT DREDGI BY: SP6

Surveyed: 02/16/2000 Project Depth: 49 Over Depth: 1 Super Depth: 2 Left Slope: 3:1 Right Sl
Original Data: bl06pd4pat.log Template Data: <Embedded> AD Data: bl50ad4pat.log

	CREDIT AREAS					CREDIT VOLUMES				
Station	Req:	Net:	OD:	SP:	Gross:	Req:	Net:	OD:	SP:	Gross:
						0:	0:	0:	0:	0:
360+00	-7:	61:	-87:	156:	-14:					
						1238:	10418:	-2371:	11552:	4556:
361+00	32:	147:	40:	75:	106:					
						2369:	10770:	-178:	8579:	2699:
362+00	15:	68:	-43:	96:	-52:					
						2506:	19556:	2966:	14084:	13144:
363+00	35:	323:	103:	186:	315:					
						3238:	28563:	7888:	17437:	24263:
364+00	30:	248:	55:	163:	171:					
						5125:	23867:	5978:	12764:	19553:
365+00	73:	229:	64:	92:	220:					
						8065:	12540:	-1038:	5513:	4740:
366+00	89:	21:	-85:	18:	-126:					
						5490:	8507:	-2087:	5104:	-1184:
367+00	21:	149:	44:	84:	102:					
						2786:	12395:	2547:	7063:	5246:
368+00	34:	99:	7:	57:	3:					
						3081:	14041:	1783:	9177:	7891:
369+00	27:	182:	28:	126:	155:					
						2837:	13669:	-828:	11661:	10854:

SAVANNAH VOLUMES CALCULATION

The Savannah Method calculates Volumes and Surface Areas of each of the three grades.

FIGURE 7-8. *The Savannah Method*

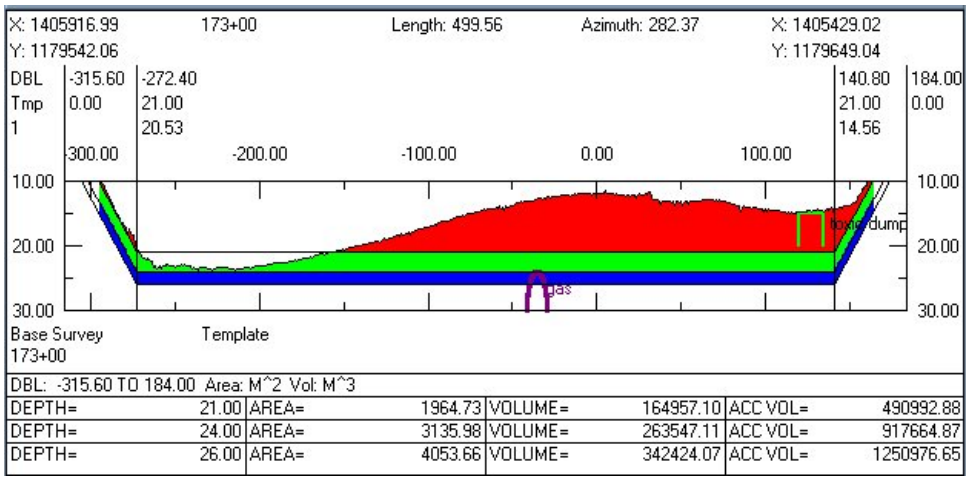


FIGURE 7-9. Savannah Report (Segment)

```
VOLUME REPORT - SAVANNAH METHOD     PLAN: 168.css      RUN 3/23/99 11:50:14 AM
Areas: Sq Meters, Volumes: Cu Meters


DREDGING QUANTITIES SUMMARY
===========================
DEPTH=        21.0 AREA=     33114.9 VOLUME=   3070766.9
DEPTH=        24.0 AREA=     61760.2 VOLUME=   5755637.6
DEPTH=        26.0 AREA=     82451.1 VOLUME=   7687689.7


DREDGING QUANTITIES CALCULATION
===============================
168+00       -87.2 TO 185.1
DEPTH=        21.0 AREA=       125.1 VOLUME=         0.0 ACC VOL=         0.0
DEPTH=        24.0 AREA=       594.0 VOLUME=         0.0 ACC VOL=         0.0
DEPTH=        26.0 AREA=      1037.3 VOLUME=         0.0 ACC VOL=         0.0

169+00       -143.1 TO 181.3
DEPTH=        21.0 AREA=       418.3 VOLUME=     27179.5 ACC VOL=     27179.5
DEPTH=        24.0 AREA=      1116.2 VOLUME=     85536.8 ACC VOL=     85536.8
DEPTH=        26.0 AREA=      1699.8 VOLUME=    136902.3 ACC VOL=    136902.3

170+00       -193.7 TO 177.5
DEPTH=        21.0 AREA=       945.9 VOLUME=     65801.4 ACC VOL=     92980.9
DEPTH=        24.0 AREA=      1899.9 VOLUME=    145242.0 ACC VOL=    230778.7
DEPTH=        26.0 AREA=      2551.4 VOLUME=    204544.2 ACC VOL=    341446.5

171+00       -239.3 TO 179.6
DEPTH=        21.0 AREA=      1101.5 VOLUME=    101903.8 ACC VOL=    194884.7
DEPTH=        24.0 AREA=      2087.7 VOLUME=    198210.9 ACC VOL=    428989.6
DEPTH=        26.0 AREA=      2839.1 VOLUME=    267804.1 ACC VOL=    609250.6
```

NORFOLK VOLUMES CALCULATION

The Norfolk method calculates volumes of all material above each user-defined level. The quantity reported for the overdepth template contains all material above the overdepth template, including material that falls above the design template. Likewise, the quantity reported for the supergrade template contains all material above the V4, supergrade, overdepth and design templates. This is different from the other Average End Area reports, where material is only reported up to the next template.

In the Graph Options Volumes Tab:

Report Titles sets a title to be printed at the top of the Volumes Report.

Planned Line File Name will be listed in the Template column of the Volumes Report where there is no Template file (*.TPL) listed.

Report Field Width controls the column width in the Volumes Report.

FIGURE 7-10. *Norfolk Graph Options*

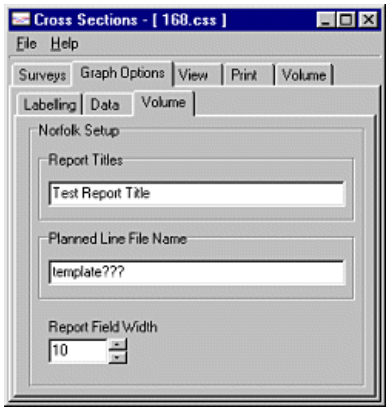


FIGURE 7-11. *Norfolk Volumes Calculations*

095_1303.B1B TO 105_1318.b1b 7/31/02 JUDY

AT DEPTH -21.00 SIDESLOPE LEFT = 3.00 SIDESLOPE RIGHT = 3.00
AT DEPTH -23.00 SIDESLOPE LEFT = 3.00 SIDESLOPE RIGHT = 3.00
AT DEPTH -24.00 SIDESLOPE LEFT = 3.00 SIDESLOPE RIGHT = 3.00

			AT -21.00 FEET		AT -23.00 FEET		AT -24.00 FEET	
STATION	WIDTH	DIST.	END AREA	CUM.VOLUME	END AREA	CUM.VOLUME	END AREA	CUM.VOLUME
095_1303.B1B	199.90	0.00	150.06	0.00	250.47	0.00	345.00	0.00
096_1305.b1b	199.90	100.00	227.55	715.54	335.72	1085.49	447.85	1468.33
097_1306.b1b	199.90	100.00	735.89	2499.64	936.23	3440.90	1111.13	4355.26
098_1308.b1b	199.90	100.00	433.34	4664.90	684.36	6442.05	906.21	8091.13
099_1309.b1b	199.90	100.00	291.97	6009.09	529.15	9689.32	769.17	11193.74
100_1311.b1b	199.90	100.00	239.95	6993.13	348.07	10313.83	530.90	13601.32
101_1312.b1b	199.90	100.00	241.01	7883.77	406.43	11711.00	615.84	15724.83
102_1314.b1b	199.90	100.00	207.23	8713.86	395.11	13195.35	549.98	17883.79
103_1315c.b1	199.90	100.00	215.95	9497.35	385.17	14640.29	569.16	19956.25
104_1317.b1b	199.90	100.00	89.22	10062.30	177.21	15601.74	294.93	21556.45
105_1318.b1b	199.90	100.00	26.33	10276.28	92.00	16180.28	194.08	22462.03

SUMMARY OF VOLUME
TEMPLATE 1 AT DEPTH -21.00 TOTAL VOLUME= 10276.28 DELTA V= 0.00
TEMPLATE 2 AT DEPTH -23.00 TOTAL VOLUME= 16180.28 DELTA V= 5903.99
TEMPLATE 3 AT DEPTH -24.00 TOTAL VOLUME= 22462.03 DELTA V= 6281.75

GLDD VOLUMES

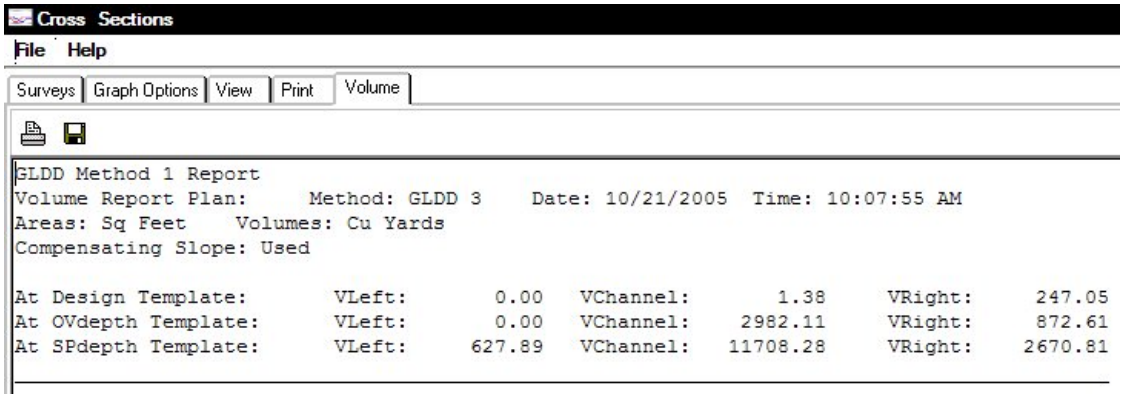
The main differences between the GLDD method and other methods:

- GLDD reports the amount of total material above each level (Design Template, Overdepth Template, and Superdepth Template). The other methods report the material above the Design Template, the material between the Design and Overdepth Templates and the material between the Overdepth and Superdepth templates.
- GLDD allows for material on the side slopes to 'fall' into voids outward from the toe line.

REPORTED VOLUMES IN THE GLDD METHOD

In the following sample report, note that the 'At OVDepth Template' states the total amount of material above the Overdepth template, *including material that is above the Design template*. The 'At SPDepth Template' states the total amount of material above the Superdepth Template, including material above the Overdepth template and material above the Design Template.

FIGURE 7-12. Sample GLDD1 Report Summary



To calculate the material available in the region between templates, subtract the volume for the upper template from the volume for the lower template. For example, to find the volumes between the Design and Overdepth templates, subtract the 'At OVDepth Template' values from the 'At Design Template' values.

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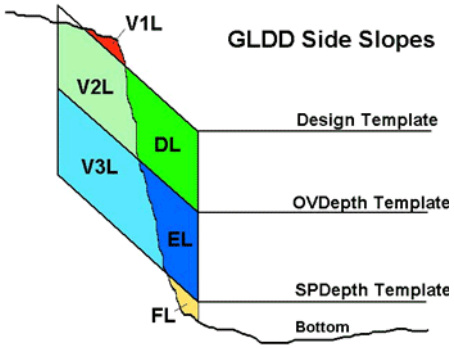
Side Slope Calculations in the GLDD Method

GLDD (Great Lakes Dock and Dredge) Volumes calculations take voids present in the side slope into account, assuming that, over time, the material higher up on the slope will drop down into the voids. The side slope volumes, therefore, report only the amount of material that exceeds the combined voids of all of the levels below.

In Figure 7-13 on page 84, V1, V2 and V3 represent the volume of material in each level, while the D, E and F areas represent the voids.

FIGURE 7-13. GLDD Volumes Channel Area Definitions

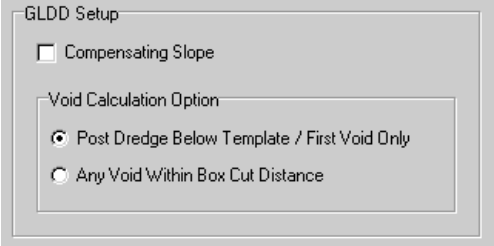


The Volumes Report uses the following formulae to calculate the volumes at each level. Neg. results are recorded as 0.

Area	Available Material	Void Applied	Reported Material
Design Template	V1L	DL+EL+FL	V1L-(DL+EL+FL)

Area	Available Material	Void Applied	Reported Material
OV Template	V1L +V2L	EL+FL	(V1L+V2L)-(EL+FL).
SP Template	V1L+V2L+V3L	FL	(V1L+V2L+V3L)-FL.

FIGURE 7-14. *GLDD Graph Options*



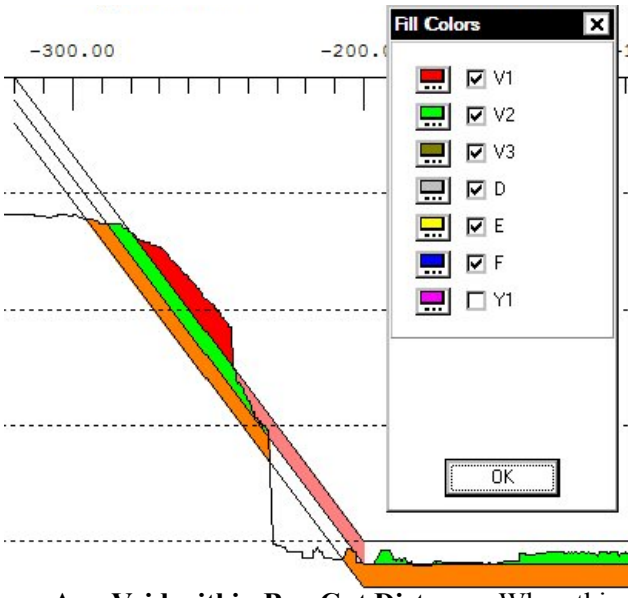
Compensating Slope tells the program to assume that available material on the side slopes will migrate into the available voids for GLDD1 calculations.

Void Calculation Options:

- **Post-dredge Below Template/ First Void Only:** The program computes a void only if the depth at the toe line is beneath the specified template.

  In the following figure, it has computed the DL void because the bottom at the toe line is beneath the Design template. It has not computed any EL or FL material, as the bottom at the toe line is above the Overdepth and Superdepth templates, respectively.

FIGURE 7-15. *Volumes are calculated only where the post-dredge depth is below the template at the toe.*



- **Any Void within Box Cut Distance:** When this option is selected, the program uses the X2L and X2R values from the Survey tab and

will include any voids outward from the toe line within the specified distance.

Beware!

BEWARE! As in the Jacksonville calculations, if the distance from the toe line to the top of bank is less than the X2 distance, it will compute any void *including the void at the top of the side slope.* V1L material will not move upward into the void.

CHINESE VOLUMES

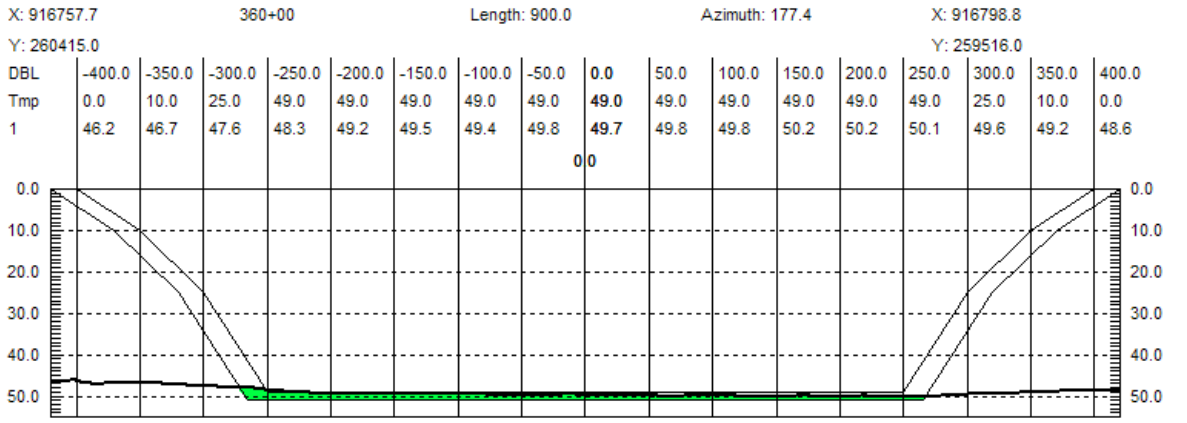
These volumes calculations, customized for some of our Chinese users, are single survey computations. They are unique in the way they handle side slope calculations.

CHINESE 1 AVERAGE END AREA CALCULATIONS

The **Chinese 1 AEA 1** method supports more than one segment in the side slopes. The number of side slopes must be the same on each side of the channel. Such channel templates would typically be created using the template editor and entered in the Template column of the Survey Tab.

In Figure 7-16, each side slope has three segments.

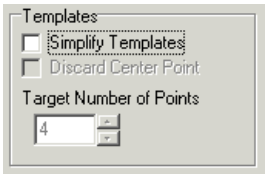
FIGURE 7-16. *Multiple Side Slope Segments*



Beware!

BEWARE! You must clear the "Simplify Templates" option in the Graph Options - Data Tab. A check in this box would generate an error and, if successful, would defeat the purpose of this method of volumes calculation.

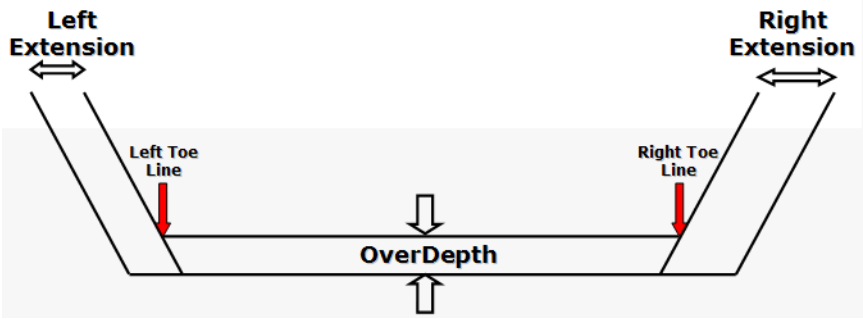
FIGURE 7-17. *Template Settings in the Graph Options*



The division between the center channel and the side slope portion of the channel is different for this method than for other calculation methods. In

most other methods, the dividing line is drawn perpendicular to the bottom at each toe and extending downward through all of the channel templates. In the Chinese 1 methods, each of the lowest side slope segments of the design template is extended past the toe and downward through the lower template levels.

FIGURE 7-18. *Chinese 1 Channel Segment Definitions*



The Volumes tab reports the volumes left and right of the center channel center line and for each segment of the template. The side slope segments adjacent to the toe are designated as Left and Right A. The remaining segments up on each side will be named in order alphabetically (B, C, etc.). The following figure shows the summary at the top of the report and the detailed report for the Design depth below. The report continues to the right with similar details about overdredge calculations.

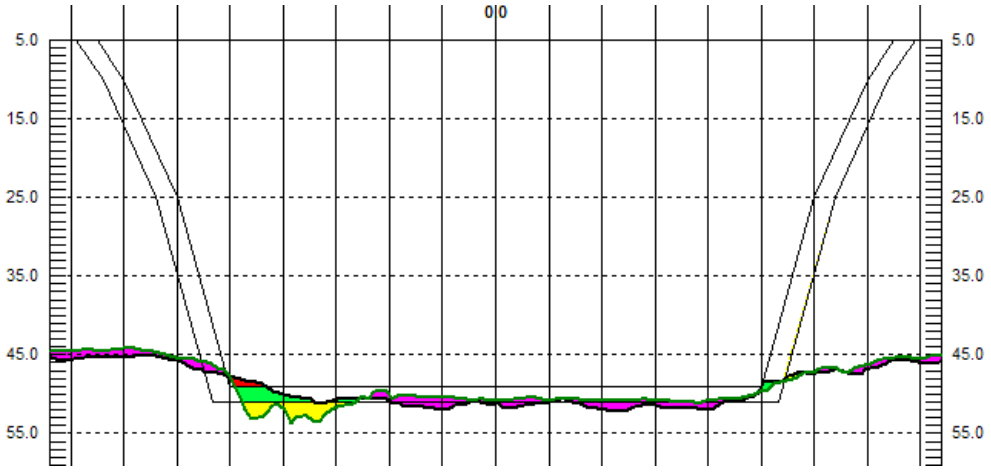
FIGURE 7-19. *Sample Chinese Average End Area 1 Report*

```
Volume Summary:
                        Channel Volume    Overdepth VolumeOverdepth Void Volume
Left C                             0.0                0.0             749981.1
Left B                             0.0                0.0            3374914.9
Left A                         20339.3           280802.4            7092448.3
Left Center Pay                                  261954.1
Left Center                   146310.7           777262.3              27953.9
Right Center Pay                                      4.5
Right Center                       3.2           293997.0             190130.5
Right A                            7.9            80230.4            7889689.7
Right B                            0.0                0.0            3343985.3
Right C                            0.0                0.0             733612.9
                      ------------------------------------------------------------
Totals:                       166661.0      Pay:  622991.4           23402716.6
                                           All: 1432292.1


Line 1         Data File: 360p00.p3a      File Date: 02/16/2000
Template: chaea_1.tpl       Overdepth: 2.0 meter
                                          DESIGN INFO
           V1L_C    V1L_B    V1L_A      V1L      V1R    V1R_A    V1R_B    V1R_C
Area:        0.0      0.0      0.5      5.9      0.0      0.0      0.0      0.0

Line 2         Data File: 361p00.p3a      File Date: 02/16/2000
Template: chaea_1.tpl       Overdepth: 2.0 meter
Distance Between Segments - Left: 99.9   Left Center: 100.0   Right Center: 100.0  Ri
                                          DESIGN INFO
           V1L_C    V1L_B    V1L_A      V1L      V1R    V1R_A    V1R_B    V1R_C
Area:        0.0      0.0      1.5     30.1      0.0      0.0      0.0      0.0
Vol:         0.0      0.0     98.3   1799.0      0.0      0.0      0.0      0.0
Void:
```

Beginning with the third line, the detail for each line will also include the accumulated volumes and void from the beginning of the channel to that line.

The **Chinese 1 Average End Area 3** method calculates the difference between pre-dredge and post-dredge data using the same rules as the Chinese 1 AEA1 method.

FIGURE 7-20. *Chinese 1 AEA 3 - View Tab*



CHINESE 1 CORE VOLUMES

The Chinese End Area 1 calculation method supports a feature we call 'core volumes'. It calculates the volume of each core level based on information you compile from core samples taken in your project area.

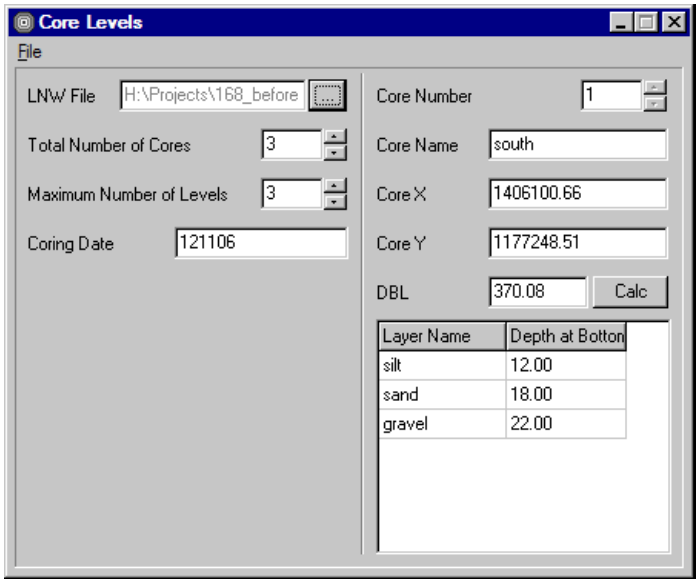
The program requires a planned line file that contains only the center line. The position of each core sample is entered and compared to the center line, and the distance from the beginning of the line (DBL) is calculated. Core levels are then interpolated between samples based on the difference in the distance down line.

1. **Take your core samples** in your project area noting the XY coordinates of each location. Take enough samples to adequately describe the core profile of your area.
2. **Examine each core sample,** recording each bottom type and to what depth each reaches.

   NOTE: The Core Levels program requires the same soil types in the same order for each sample; however, the levels in each profile may change.

3. **Create a Planned Line file that defines the channel's center line**.
4. **Create a core file**.
   a. **Open the CORE LEVELS utility** by selecting UTILITIES-OTHER-CORE LEVELS FOR VOLUMES. The Core Levels dialog will appear.

FIGURE 7-21. *Core Levels Dialog*



b. **Enter the information on the left side of the form**. The table on the right side will update to reflect the number of cores and levels.

c. On the right side of the form, **enter the information for each core sample**:

- **Enter the Core Name** (any alpha numeric name you choose) and **position**.
- **Click [Calc]** and the program will calculate the distance from the beginning of the center line.

NOTE: This utility assumes all samples are taken along the centerline and that they are representative of the entire swath perpendicular to the center line from that point.

- **Enter the Layer Names and their lower depths**.

d. **When the form is complete for the current core sample, advance to the next form using the arrow buttons to increment the Core Number.** The right side of the window will reset ready for information based on the next core sample. The Layer Names will remain populated, as they must be the same for each profile.

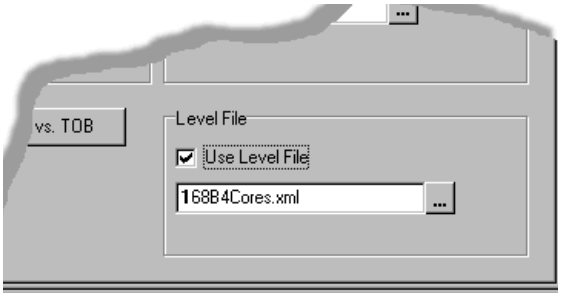
e. **When all samples have been described, save your Core Level file** by selecting FILE-SAVE and naming your file. The information will be read to an XML database file and stored, by default, in the Core folder in your project.

f. **Exit the program**.

5. Launch CROSS SECTIONS AND VOLUMES and load your session.

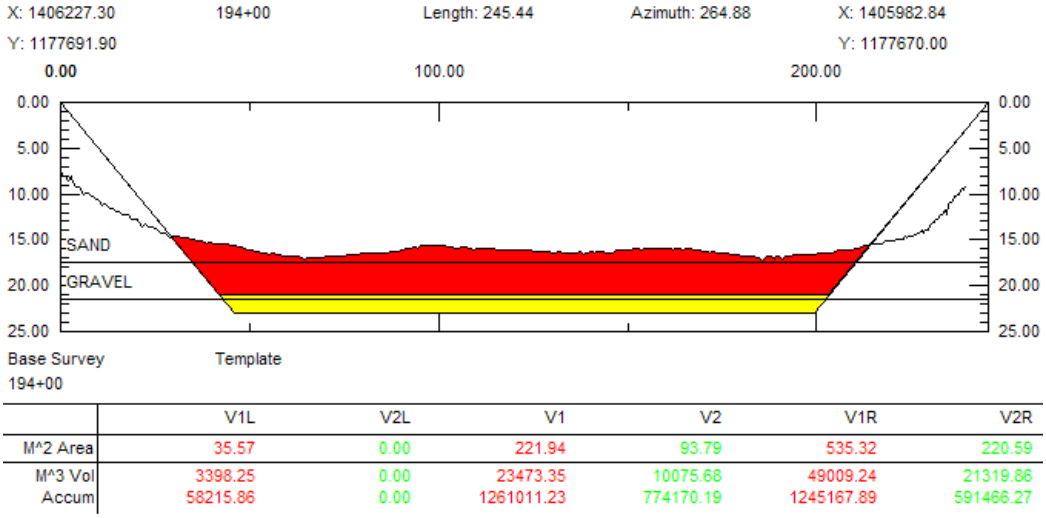
6. In the Graph Options-Data tab, **check the 'Use Level File' option**, click the […] and browse for your Core Level file.

FIGURE 7-22. *Lower Right Corner of the Graph Options- Data Tab*



Once the Level File is entered, the core levels will be drawn in the View Tab.

FIGURE 7-23. *View Tab – Core Levels*



	V1L	V2L	V1	V2	V1R	V2R
M^2 Area	35.57	0.00	221.94	93.79	535.32	220.59
M^3 Vol	3398.25	0.00	23473.35	10075.68	49009.24	21319.86
Accum	58215.86	0.00	1261011.23	774170.19	1245167.89	591466.27

The Volumes Tab will include calculations by level and accumulated values at the end.

FIGURE 7-24. *Volumes Tab – Volumes by Line Segment and Core Level, Accumulated Volumes at the End*

```
Line 34              Data File: 201p00.be2     File Date: 06/04/97
Template: From File  Overdepth: 2.00 meter
Distance Between Segments - Left: 99.97  Left Center: 99.99  Right Center: 100.03 Right: 100.07
                          DESIGN INFO                                  OVERDEPTH INFO
            V1L_A       V1L       V1R      V1R_A      V2L_A      V2LP       V2L       V2RP       V2R      V2R_A
Area:       85.60    185.68   1044.22      46.74      45.41     35.60     35.60    255.40    255.40      35.21
SAND        69.60    106.48    525.42      30.74      21.41      0.00      0.00      0.00      0.00      11.21
GRAVEL      16.00     79.20    518.80      16.00      16.00      0.00      0.00      0.00      0.00      16.00

Vol:      7398.62  17305.45 103051.84   4403.97    4207.31   3599.62   3599.62  25516.40  25516.40    3441.51
SAND      5799.03   9306.30  51218.85   2802.91    1807.92      0.00      0.00      0.00      0.00    1039.93
GRAVEL    1599.60   7999.16  51832.99   1601.05    1599.60      0.00      0.00      0.00      0.00    1601.05

Void:                9692.12                0.00                 0.00   8455.11
SAND                 9692.12                0.00                 0.00   8455.11
GRAVEL                  0.00                0.00                 0.00      0.00

AccV:    92483.63 1389654.64 1794620.23 124339.45   75894.08 741622.11 811497.86 757945.31 765447.46   56011.50
SAND     64079.57  457322.40  641294.48  91857.23   31002.20      0.00      0.00      0.00      0.00   18180.10
GRAVEL   28404.05  932332.24 1153325.75  32482.22   33334.35 346975.60 366932.79 288334.02 289851.36   27424.56

AVoid:              330959.70              930.00                 0.00  85590.66
SAND                324250.90                0.00                 0.00  85200.05
GRAVEL                6708.50                0.00                 0.00    390.60
```

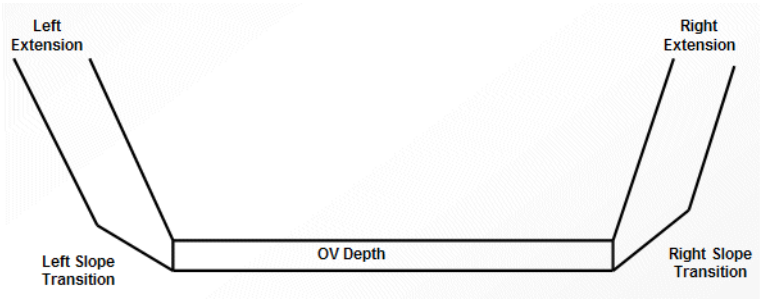
CHINESE 2 AVERAGE END AREA 1

Chinese 2 volumes calculations requires 4 segments in the design template: the center, and the toes and top of bank points on each side.

The **Chinese 2 Average End Area 1** method is a single survey volumes calculation, while **Chinese 2 Average End Area 3** reports the difference between pre-dredge and post-dredge surveys.

The Chinese 2 methods define the overdepth differently than other methods. The **Overdredge Depth** in the Survey tab defines the distance between the design and overdredge templates *only in the center channel*. The ends of the center channel overdredge area is defined by a vertical line extending down from the toe of the design template.

FIGURE 7-25. *Chinese 2 Channel Segment Definitions*

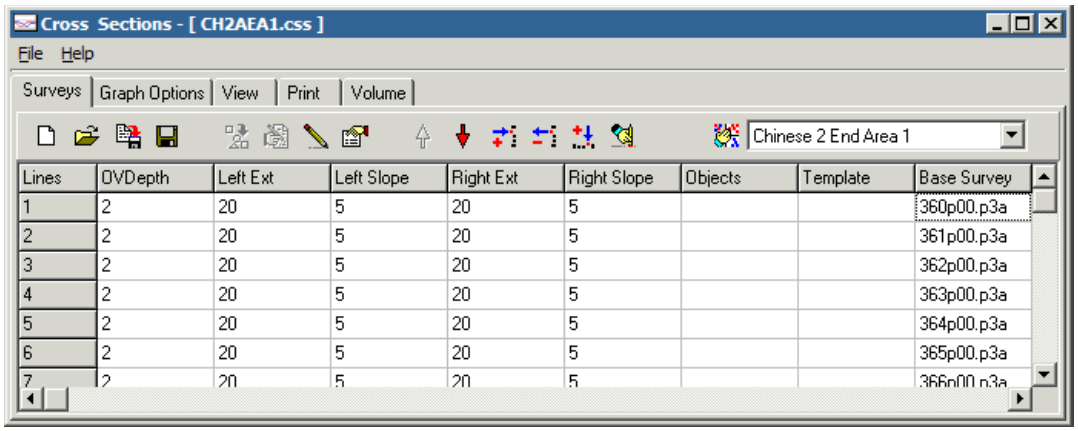


The Survey tab includes added values affecting the side slope areas *in the overdredge area*.

- **Left and Right Extension** values set the distance between the design and overdredge templates on the side slopes.
- **Left and Right Slope** values define the slope of the line connecting the toes to the side slopes.

The following figures show corresponding tabs using the Chinese 2 AEA1 method. The distance between the templates on the side slope is set to 20 on each side, and the segments connecting the overdredge side slope to the toe have a slope of 5.

FIGURE 7-26. *Chinese 2 AEA 1- Survey Tab*



Lines	OVDepth	Left Ext	Left Slope	Right Ext	Right Slope	Objects	Template	Base Survey
1	2	20	5	20	5			360p00.p3a
2	2	20	5	20	5			361p00.p3a
3	2	20	5	20	5			362p00.p3a
4	2	20	5	20	5			363p00.p3a
5	2	20	5	20	5			364p00.p3a
6	2	20	5	20	5			365p00.p3a
7	2	20	5	20	5			366p00.p3a

FIGURE 7-27. *Chinese 2 AEA 1- View Tab*

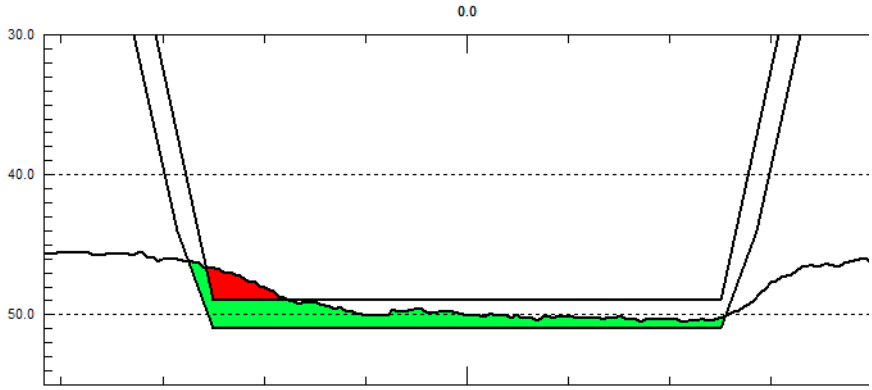
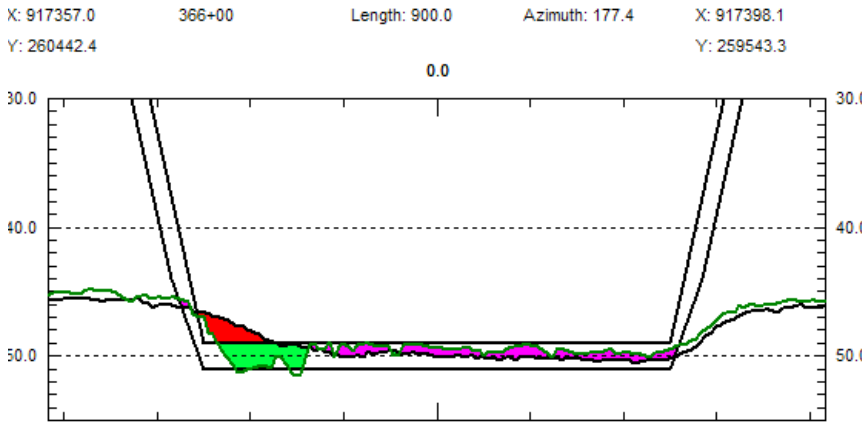


FIGURE 7-28. *Chinese 2 AEA 3- View Tab*



The volumes report follows the same format as the Chinese 1 calculation methods.

FIGURE 7-29. *Chinese 2 AEA 1 – Sample Volumes Report*

```
Volume Summary:
                          Channel Volume    Overdepth VolumeOverdepth Void Volume
Left A                           31172.0           159540.7                  0.0
Left Center Pay                                    256454.2
Left Center                     146310.7           771762.4                  0.0
Right Center Pay                                     3.1
Right Center                       3.2           290576.6                  0.0
Right A                           26.0            22792.0                  0.0
                         ---------------------------------------------------------
Totals:                         177511.9      Pay:  438790.1                  0.0
                                           All: 1244671.8


Line 1         Data File: 360p00.p3a      File Date: 02/16/2000
Template: From File  Overdepth: 2.0 meter
                     DESIGN INFO                                  OVERDEPTH INFO
           V1L_A      V1L      V1R    V1R_A         V2L_A     V2LP      V2L      V2RP      V2R    V2R_A
Area:        0.8      5.9      0.0      0.0          26.1     43.0    386.7       0.0    260.1      6.5

Line 2         Data File: 361p00.p3a      File Date: 02/16/2000
Template: From File  Overdepth: 2.0 meter
Distance Between Segments - Left: 99.9   Left Center: 100.0   Right Center: 100.0  Right: 100.0
                     DESIGN INFO                                  OVERDEPTH INFO
           V1L_A      V1L      V1R    V1R_A         V2L_A     V2LP      V2L      V2RP      V2R    V2R_A
Area:        2.1     30.1      0.0      0.0          30.2    120.9    394.6       0.0    224.8      5.8
Vol:       144.8   1799.0      0.0      0.0        2813.7   8190.7  39042.3       0.0  24234.5    614.8
Void:                                               0.0              0.0                0.0      0.0
```

KINGFISHER VOLUMES

The Kingfigher method allows you to choose a different overdredge basis for each segment--Left Slope, Center Channel and Right Slope.

Set the overdredge basis for each segment and click [OK]. The overdredge bases are:

- **Smart** for contour dredging
- **All** to include all overdredge material
- **None** to exclude all overdredge material

The report shows area and volumes for each section, and the cumulative pay volumes, but it does not show volumes by line segment.

FIGURE 7-30. *Sample Kingfisher Report*

```
RUN DATE: 2/11/2010          DREDGE VOLUME CALCULATIONS
RUN TIME: 3:24:37 PM

-------------------------------------------------------------------------------------------------------------------
     LINE       DIST|********* REMAINING DEPTH *********|************ OVERDEPTH ************|        TOTAL
  STATION   INTERVAL|     END AREA      INT VOL     TOT VOL|     END AREA      INT VOL     TOT VOL|      PAY VOL
   NUMBER        (M)|         (SM)         (CM)        (CM)|         (SM)         (CM)        (CM)|         (CM)
-------------------------------------------------------------------------------------------------------------------

-------------------------
DATE SURVEYED: 02/16/2000
-------------------------
   360+00        0.00        6.59        0.00        0.00      168.05        0.00        0.00        0.00
   361+00       99.95       32.17    1,937.32    1,937.32      168.10   16,799.42   16,799.42   18,736.74
   362+00      100.01       15.74    2,395.74    4,333.05      128.92   14,851.21   31,650.63   35,983.68
   363+00       99.96       34.89    2,530.12    6,863.17      226.10   17,742.76   49,393.39   56,256.56
   364+00      100.01       29.79    3,233.80   10,096.98      146.87   18,649.35   68,042.74   78,139.72
   365+00      100.01       73.73    5,175.90   15,272.87      196.71   17,179.31   85,222.06  100,494.93
   366+00      100.00      106.31    9,001.90   24,274.77      145.16   17,093.73  102,315.79  126,590.56
   367+00      100.01      100.70   10,350.96   34,625.73      205.89   17,553.19  119,868.98  154,494.71
   368+00      100.00       76.16    8,843.27   43,469.00      136.10   17,099.98  136,968.96  180,437.96
   369+00      100.01       49.80    6,298.44   49,767.44      164.20   15,015.84  151,984.80  201,752.23
```

COMPUTING REACH VOLUMES USING THE CHANNEL PLAN FEATURE

The Channel Plan feature of CROSS SECTIONS AND VOLUMES enables you to re-define and compute volumes for a single reach of a channel. A reach is one straight section of the channel center line Multiple segments along the center line are not allowed.

This feature provides a quick and easy way to compute and compare volumes with varied channel template information. Use the Channel Plan feature to define the channel template for the reach and note the difference in the Volume Tab when a change is made to the Project Depth field.

In the Cross Sections and Volumes program:

1. **Select FILE-CHANNEL PLAN** and enter the Channel Plan information.
2. **Click [OK]** to close the Channel Plan dialog.
3. **Enter the information in each tab as usual.** The volumes will be calculated using the template information defined in the Channel Plan dialog. It will override the template information in the header of the survey files and in the template column in the Survey Tab.

NOTE: Enter only data files that are included in your reach. If you enter survey lines that are not part of the reach, you will get an error message reading "Survey line xxx does not cross center line." and you will not be allowed to proceed until you have removed the offending lines with the delete function in the Survey Tab.

CHANNEL PLAN INFORMATION IN CROSS SECTIONS AND VOLUMES

Using the Channel Plan option, you can define a new channel template and a channel depth. Once this is done, you can easily calculate the difference in volumes by changing the project depth and comparing the results in the volumes reports.

1. **Select FILE-CHANNEL PLAN and enter the coordinates and their chainage** (distance along the channel center line) in the top part of the Channel Plan dialog.
2. **Define the new channel template** in the lower half of the dialog. Enter the information for:
   - the first and last survey line of the reach
   - anywhere in the reach where the template changes.
   - anywhere where the survey line is not perpendicular to the center line. Enter a positive angle to indicate a clockwise rotation of the survey line.

3. **Define the Project Depth** in the corresponding field. It is uniform for the reach calculation. (The reach is defined by the X,Y coordinates of the starting point and ending point.)

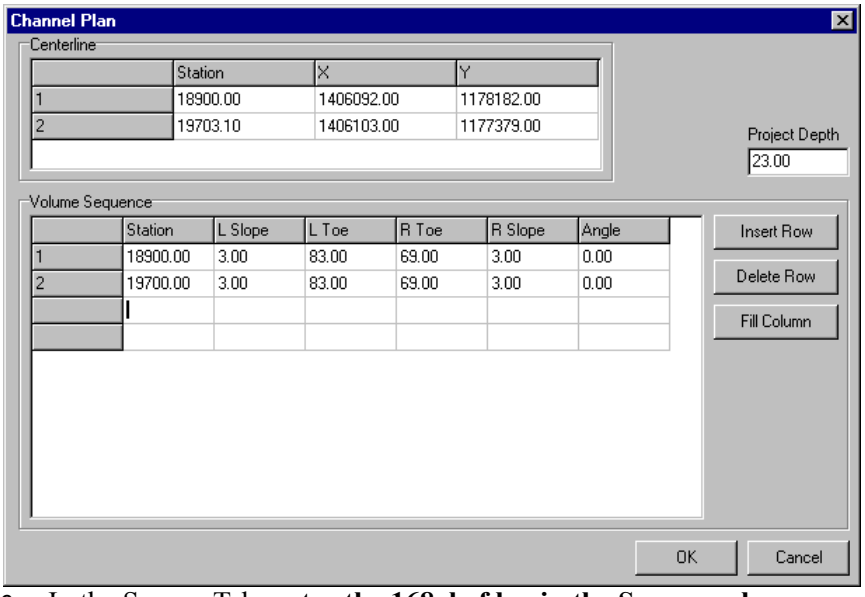
EXAMPLE: USING THE CHANNEL PLAN FEATURE IN CROSS SECTIONS AND VOLUMES

Example:

Calculating Reach Volumes with the Channel Plan FeatureCalculate the volumes for the segment from 189+00 to 197+00 in the 168_bef.log. This is a straight section of the channel in the middle of the file. Compare the volumes with depths of 23 and 24.

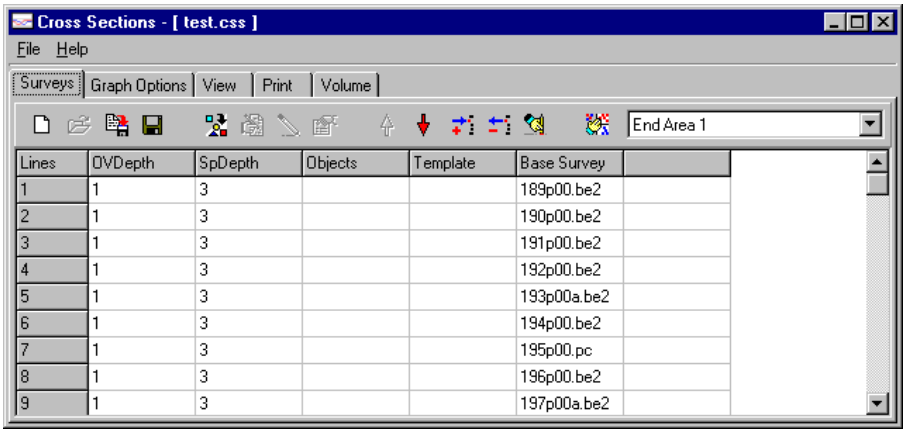
1. **Load the planned lines in HYPACK®.**
2. **Get the X,Y coordinates for the first line** by pointing the cursor at the point where it crosses the center line, and noting the X,Y coordinates from the status bar.
3. **Get the X,Y coordinates for the last line** using the same method.
4. **Use the measuring tool, measure the distance of the left and right toe lines from the center line**. Enter them to the spreadsheet.
5. **Select FILE-CHANNEL PLAN and enter the information in the Channel Plan dialog** with the Project Depth=23 and slopes=3, and click [OK].

FIGURE 7-1. *Channel Plan dialog*



6. In the Survey Tab, **enter the 168_bef.log in the Survey column**.
7. **Use the [Delete] to remove lines169+00 through 188+00 and198+00 through 201+00.** These are not part of your reach.

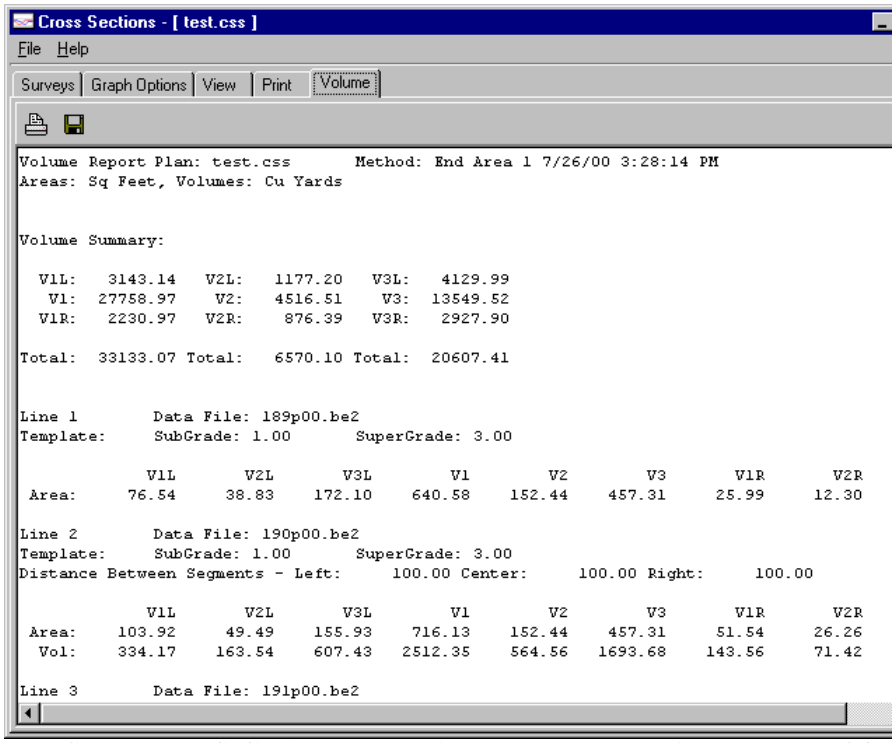
FIGURE 7-2. *Entering the Survey Lines in the Survey Tab*



Lines	OVDepth	SpDepth	Objects	Template	Base Survey
1	1	3			189p00.be2
2	1	3			190p00.be2
3	1	3			191p00.be2
4	1	3			192p00.be2
5	1	3			193p00a.be2
6	1	3			194p00.be2
7	1	3			195p00.pc
8	1	3			196p00.be2
9	1	3			197p00a.be2

8. **Click on the Volumes Tab** to see your calculated volumes.

FIGURE 7-3. *Volumes at depth of 23*

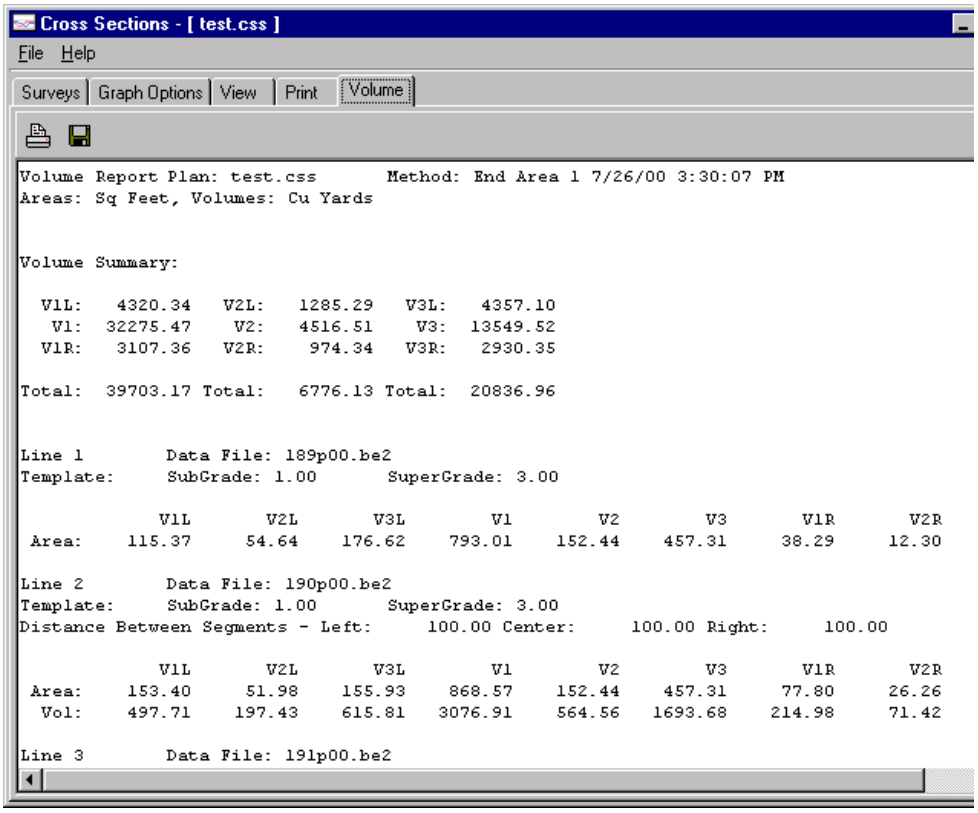



```
Volume Report Plan: test.css       Method: End Area 1 7/26/00 3:28:14 PM
Areas: Sq Feet, Volumes: Cu Yards


Volume Summary:

  V1L:   3143.14   V2L:   1177.20   V3L:   4129.99
   V1:  27758.97    V2:   4516.51    V3:  13549.52
  V1R:   2230.97   V2R:    876.39   V3R:   2927.90

Total:  33133.07 Total:   6570.10 Total:  20607.41


Line 1        Data File: 189p00.be2
Template:     SubGrade: 1.00       SuperGrade: 3.00

             V1L       V2L       V3L        V1        V2        V3       V1R       V2R
 Area:     76.54     38.83    172.10    640.58    152.44    457.31     25.99     12.30

Line 2        Data File: 190p00.be2
Template:     SubGrade: 1.00       SuperGrade: 3.00
Distance Between Segments - Left:     100.00 Center:     100.00 Right:     100.00

             V1L       V2L       V3L        V1        V2        V3       V1R       V2R
 Area:    103.92     49.49    155.93    716.13    152.44    457.31     51.54     26.26
  Vol:    334.17    163.54    607.43   2512.35    564.56   1693.68    143.56     71.42

Line 3        Data File: 191p00.be2
```

9. **Select FILES-CHANNEL PLAN, change the Project Depth to 24 and click [OK]**.

Note the change in values in the Volumes Tab.

Volumes at depth of 24



EXAMPLES IN CROSS SECTIONS AND VOLUMES

CROSS SECTIONS SESSIONS—A SAMPLE SETUP

Example: Creating a Cross Sections Session.

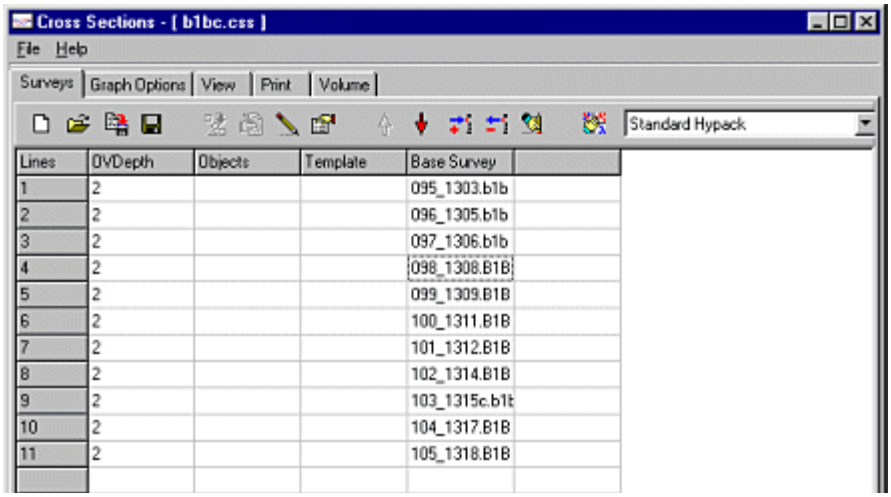
Use the Standard HYPACK Method and plot the sections from the \HYPACK\PROJECTS\B1B\EDIT\B1B.LOG file. Set the top of the chart to 0.0 and the bottom of the chart to 30.0. Place horizontal tic marks every 10 meters with a label every 100 meters. Export the same cross section profiles to B1B.DXF and to your printer.

Solution:

1. **Open the B1B Project** by selecting FILE-OPEN PROJECT and selecting B1B.
2. **Open the CROSS SECTION AND VOLUMES program** by selecting FINAL PRODUCTS-Cross Section and Volumes or by clicking on the Cross Section and Volumes icon.
3. **Select FILE-NEW SESSION** to clear the SURVEY window.

The Survey Tab:

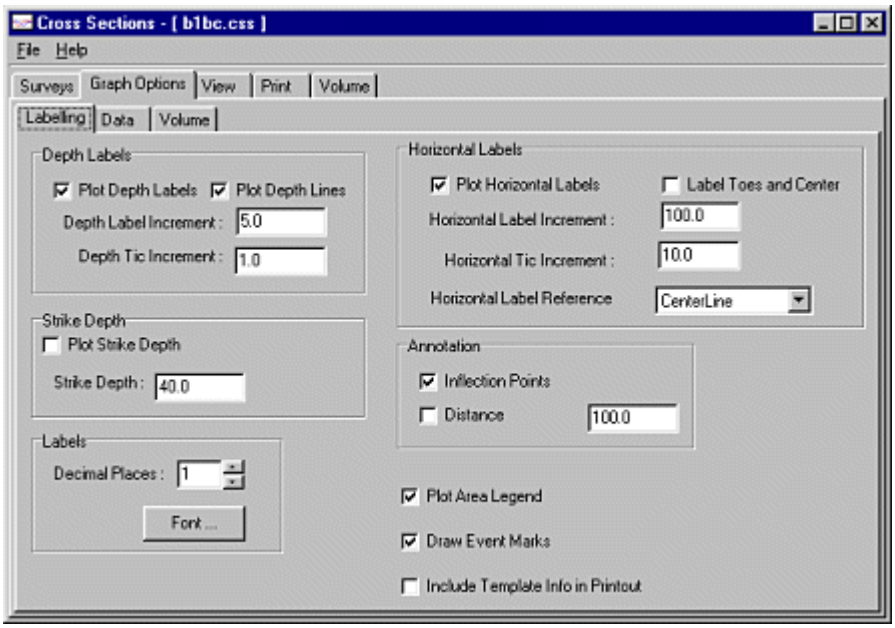
FIGURE 7-1. *The Survey Tab*



1. **Open the B1B.LOG file** by clicking in the top cell of the Base Survey column, selecting FILE OPEN and the B1B.LOG file from the Edit directory. The files contained in the B1B.LOG will be listed in the Base Survey column in the order that they appear in the catalog file.
2. **Select STANDARD HYPACK** from the drop-down box at the end of the icon bar.
3. **Enter an OVDepth = 2** by clicking in the top cell of the OVDepth column and entering “2”. Click on the FILL COLUMN icon and all of the cells in that column will read “2”.

The GRAPH OPTIONS Tab:

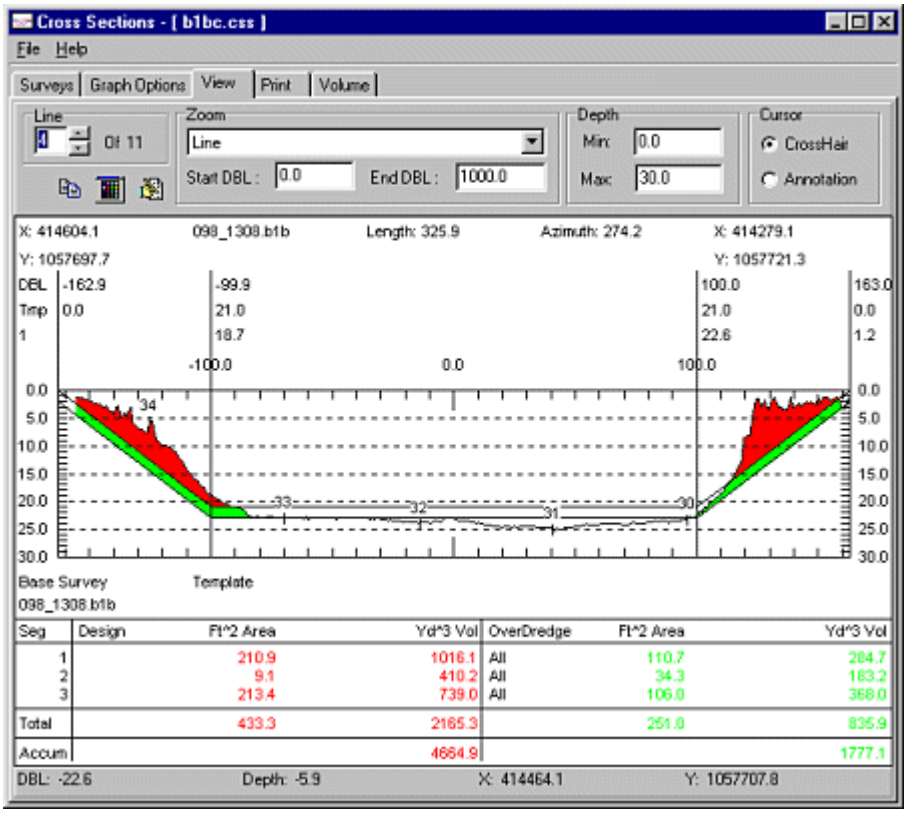
FIGURE 7-2. *The Graph Options Tab*



4. **Click** on the GRAPH OPTIONS-LABELLING TAB and enter the following:
   a. Horizontal Label Increment=100
   b. Horizontal Tic Increment = 10

The View Tab:

FIGURE 7-3. *The View Tab*



5. **Click on the VIEW Tab and fill in the following**:
   a. Enter Min. Depth = 0
   b. Max. Depth = 30.

The PRINT Tab:

6. **Click on the PRINT Tab and fill in the following**:
   a. Horizontal Scale = 50.00
   b. Vertical Scale = 10.00.
   c. Output Units should be set to Feet per Inch.
7. **Click on [DXF Out]** and fill in the following:
   a. Number of Columns = 1
   b. Number of Rows = 2
   c. Plot View: 1 to 6
8. **Click on [Print]** to print your results.

EXAMPLE OF CHANGING TEMPLATES

Example: Changing the Channel Template

The B1B.LOG data located in the \Hypack\Projects\B1B\Edit directory all used the same template. This had the left toe line located 63.0 meters

from the line origin, the center line at 162.9 meters from the line origin and the right to line at 262.9 meters from the line origin. All three points were at a depth of 21 meters. Both side slopes were 3:1 (horizontal:vertical) ratios.

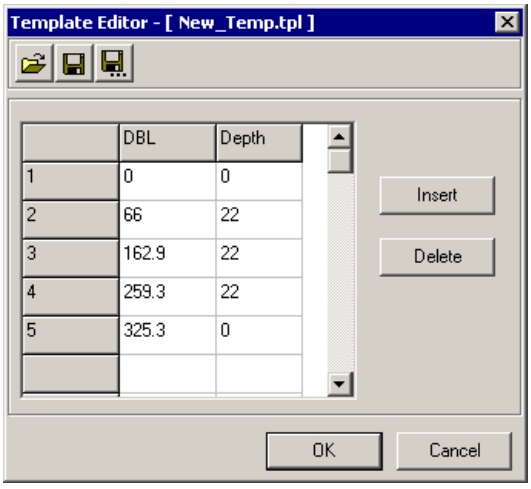
Compute a new volume quantity using the Standard HYPACK® method with the following channel design.

Point	Distance from Line Origin	Depth
Left Surface	0.0	0.0
Left Toe	66.0	22.0
Center Line	162.9	22.0
Right Toe	259.3	22.0
Right Surface	325.3	0.0

Solution:

1. **Set the Geodetic Units to match the units of the data files.** These data files are based on U.S. Survey Foot. Select PREPARATION-GEODETIC PARAMETERS and set the units to U.S. Survey Foot. The volumes calculated will be cubic yards. Click [OK].
2. **Start the CROSS SECTION AND VOLUMES program** by selecting FINAL PRODUCTS-Cross section and VOLUMES or by clicking on the Cross section and VOLUMES icon.
3. **Create the Cross Section Session**.
4. **Load the B1B.log** from the edit directory.
5. **Set the Calculation method** to Standard HYPACK. The Volume Tab shows a volume
6. **Create the new template**. The Template column is blank because the channel templates are included in the sounding files.

FIGURE 7-4. *Template Editor*

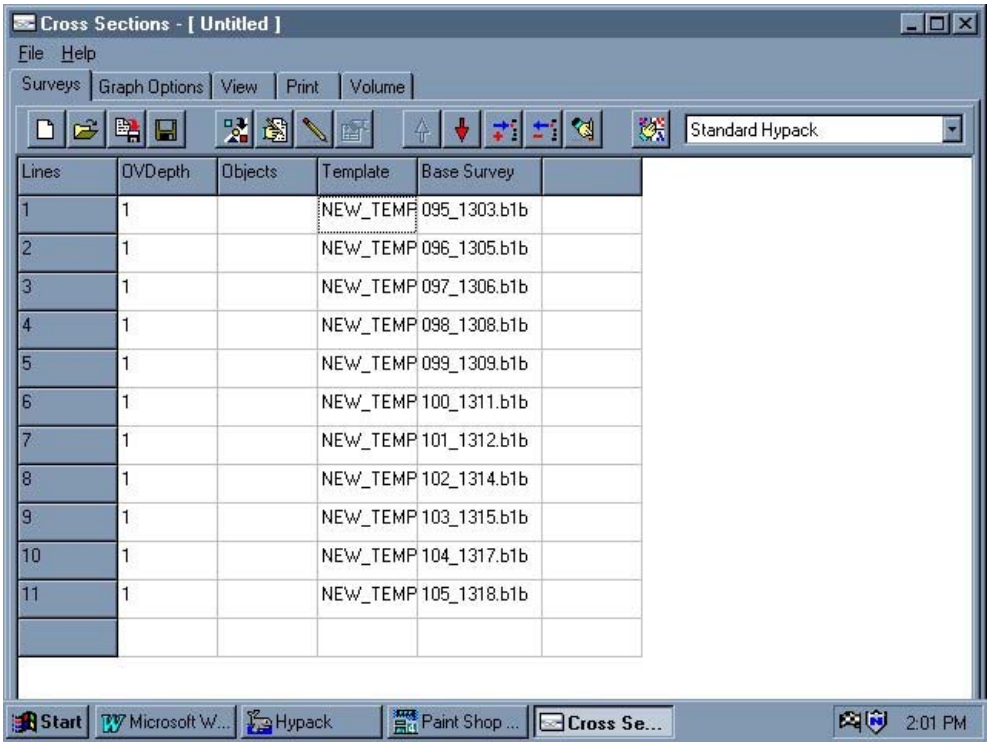


7. **Click [OK]** to exit the TEMPLATE EDITOR and return to the Survey Tab. The NEW_TEMP template will be in the first cell of the

template column (This is the cell where your cursor was positioned before your clicked [New Template]. If you had placed the cursor further down the column, the new template would have appeared at that point.)

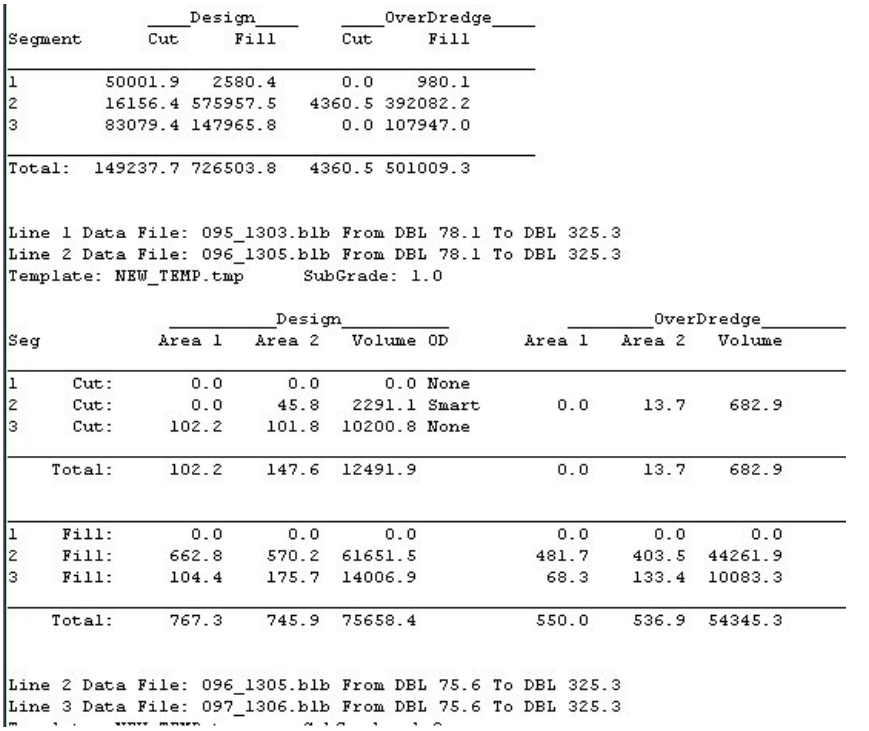
8. **Click on [Fill Column]** to use the new template for all lines in your file. The Spreadsheet should look like the following figure.

FIGURE 7-5. *The Completed VOLUMES Spreadsheet*



9. **Calculate Volumes.** Select the Volumes Tab. The Volumes Report will be displayed. At the end of the report, the total cut volume above design in the deeper channel is shown to be 149237.7 cubic meters.

FIGURE 7-6. *The Volumes Tab*



```
                ____Design____      ____OverDredge____
Segment       Cut      Fill       Cut      Fill
_____________________________________________________
1          50001.9    2580.4       0.0     980.1
2          16156.4  575957.5    4360.5  392082.2
3          83079.4  147965.8       0.0  107947.0
_____________________________________________________
Total:   149237.7  726503.8    4360.5  501009.3


Line 1 Data File: 095_1303.blb From DBL 78.1 To DBL 325.3
Line 2 Data File: 096_1305.blb From DBL 78.1 To DBL 325.3
Template: NEW_TEMP.tmp      SubGrade: 1.0

                ___________Design___________          ________OverDredge________
Seg           Area 1   Area 2   Volume OD       Area 1   Area 2   Volume
_____________________________________________________________________________
1     Cut:       0.0      0.0       0.0 None
2     Cut:       0.0     45.8    2291.1 Smart       0.0     13.7    682.9
3     Cut:     102.2    101.8   10200.8 None
_____________________________________________________________________________
    Total:     102.2    147.6   12491.9             0.0     13.7    682.9


_____________________________________________________________________________
1    Fill:       0.0      0.0       0.0             0.0      0.0      0.0
2    Fill:     662.8    570.2   61651.5           481.7    403.5  44261.9
3    Fill:     104.4    175.7   14006.9            68.3    133.4  10083.3
_____________________________________________________________________________
    Total:     767.3    745.9   75658.4           550.0    536.9  54345.3


Line 2 Data File: 096_1305.blb From DBL 75.6 To DBL 325.3
Line 3 Data File: 097_1306.blb From DBL 75.6 To DBL 325.3
```

CALCULATING VOLUMES–A COMPARISON OF METHODS

Example:

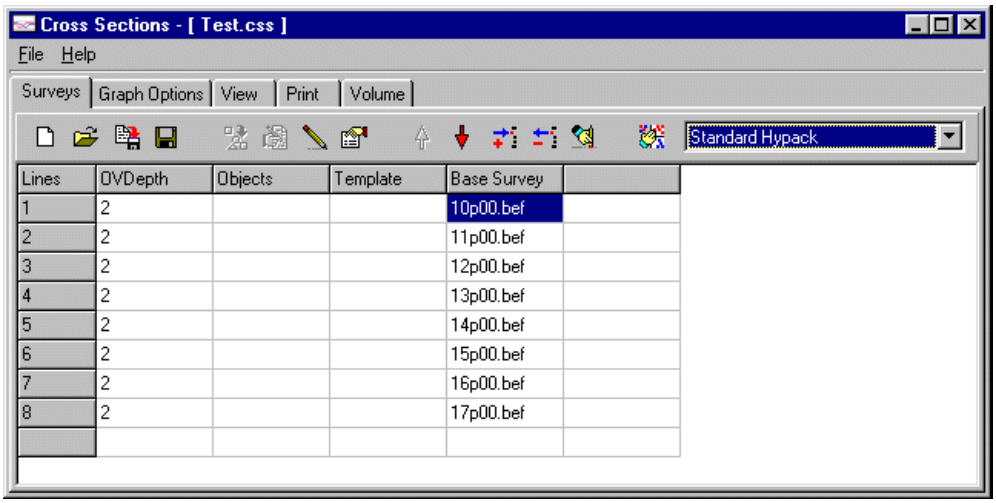
A Comparison of MethodsUse the CROSS SECTION AND VOLUMES program to calculate the volume of material above the design grade with each method using the Before.LOG File (and the After.LOG for the End Area 3 Method) in the edit directory of the Olcott Project. Compare the results.

Solution:

Begin each method with the following steps then continue with the procedures described for each calculation method.

1. **Open the Olcott project** by selecting FILE-OPEN PROJECT and selecting OLCOTT from the listing presented.
2. **Before making any volume computations on these data files, select PREPARATION- GEODETIC PARAMETERS and set the Units to Meters to match the survey units**. When the volumes are calculated on a foot grid, the results are in cubic yards. On a metric grid, results are in cubic meters.
3. **Start the CROSS SECTION AND VOLUMES Program** by selecting FINAL PRODUCTS-CROSS SECTION AND VOLUMES or by clicking on the CROSS SECTION AND VOLUMES icon.

FIGURE 7-7. The Survey Tab of Cross Sections and Volumes



4. **Create the Cross Section Session**.
   a. Load the Survey files.
   b. Set the overdredge limit.

NOTE: Save your session by selecting FILE-SAVE SESSION and naming your session. The settings will be saved to a Cross Sections Session (*.CSS) file. After each volumes calculation, you can then reload the data to this point by selecting FILE-OPEN SESSION and selecting your CSS file.

STANDARD HYPACK® METHOD

1. **Choose a Computation Method.** We will choose the Standard HYPACK® Method first.

The Template column is blank because the channel templates are included in the sounding files.

2. **Calculate Volumes**. Select the Volumes Tab and the Volumes Tab will display the Volumes Report based on the information you have just entered.

FIGURE 7-8. *Standard HYPACK Volumes Report (Segment)*

Volume Report Plan: Olcott.css Method: Standard Hypack 3/29/00 2:05:20 PM
Areas: Sq Meters, Volumes: Cu Meters

Volume Summary:

Segment	Design Cut	OverDredge Cut
1	12325.74	9253.78
2	275410.83	96602.10
3	10452.03	4838.95
Total:	298188.60	110694.83

Line 1 Data File: l0p00.bef
Template: SubGrade: 1.00

Seg		Design Area	Design Volume	OD	OverDredge Area	OverDredge Volume
1	Cut:	1.23	0.00	All	4.64	0.00
2	Cut:	63.97	0.00	All	112.09	0.00
3	Cut:	0.00	0.00	All	0.00	0.00
	Total:	65.19	0.00		116.73	0.00

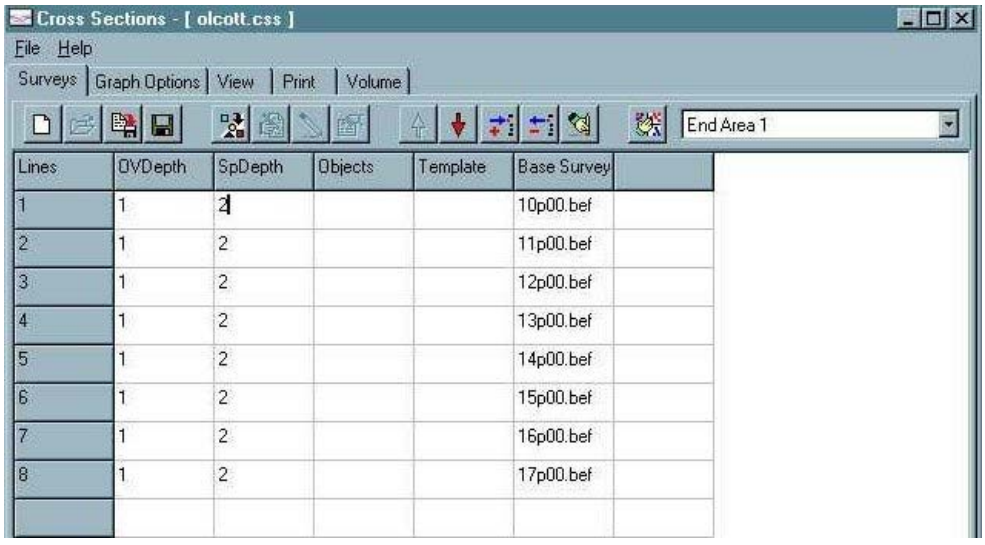
Total Cut Volume = 298,188.60 m3

Now calculate volumes for each of the other three methods by repeating the process starting with Step 4.

THE END AREA 1 METHOD

1. **Choose a computation method on the Survey Tab**. This time select End Area 1 method from the Method List. An additional column will appear in the spreadsheet titled Supergrade Depth. Click on the cell corresponding to Line #1, Supergrade Depth and enter “2” (followed by the Enter key). Click [Fill Column] to use “2” for all lines.

FIGURE 7-9. *Choosing the End Area 1 Method*



2. **Calculate Volumes**. Select the Volumes Tab and the Volumes Tab will display the Volumes Report based on the information you have just entered.

FIGURE 7-10. *End Area 1 Volumes Report (Segment)*

```
Volume Report Plan: Olcott.css     Method: End Area 1 3/29/00 2:10:40 PM
Areas: Sq Meters, Volumes: Cu Meters


Volume Summary:

  V1L:  12325.74   V2L:   9253.78   V3L:      0.00
   V1: 275410.77    V2:  96602.07    V3:      0.00
  V1R:  10452.03   V2R:   4838.95   V3R:      0.00

Total: 298188.54 Total: 110694.80 Total:      0.00


Line 1        Data File: 10p00.bef
Template:     SubGrade: 1.00       SuperGrade: 0.00

             V1L       V2L       V3L        V1        V2        V3       V1R       V2R
 Area:      1.23      4.64      0.00     63.97    112.09      0.00      0.00      0.00

Line 2        Data File: 11p00.bef
Template:     SubGrade: 1.00       SuperGrade: 0.00
Distance Between Segments - Left:      99.97 Center:      99.96 Right:      99.96

             V1L       V2L       V3L        V1        V2        V3       V1R       V2R
 Area:     16.89     14.51      0.00    320.90    140.00      0.00     18.36     14.28
  Vol:    905.58    957.47      0.00  19236.40  12599.91      0.00    917.56    713.78

Line 3        Data File: 12p00.bef
```

The total volumes calculations for each defined section appear at the top.

The Total Cut Volume = 298,188.54

The difference in the result from the Standard HYPACK® Method is insignificant.

END AREA 2 METHOD

1. **Choose a Computation Method in the Survey Tab.** This time select End Area 2 method from the Method List.
2. **Calculate Volumes.** Select the Volumes Tab and the Volumes Tab will display the Volumes Report based on the information you have just entered.

FIGURE 7-11. *End Area 2 Volumes Report (Segment)*

```
Volume Report Plan: Olcott.css     Method: End Area 2 3/29/00 2:11:29 PM
Areas: Sq Meters, Volumes: Cu Meters


Volume Summary:

  V1L:  12325.74   V2P:  96119.33    V3:      0.00
   V1: 275410.77  V2NP:    482.74
  V1R:  10452.03

Total: 298188.54 Total:  96602.07 Total:      0.00


Line 1        Data File: l0p00.bef
Template:     SubGrade: 1.00       SuperGrade: 0.00

             V1L        V1       V2P      V2NP        V3       V1R
 Area:      1.23     63.97    102.43      9.66      0.00      0.00

Line 2        Data File: l1p00.bef
Template:     SubGrade: 1.00       SuperGrade: 0.00
Distance Between Segments - Left:      99.97 Center:      99.96 Right:      99.96

             V1L        V1       V2P      V2NP        V3       V1R
 Area:     16.89    320.90    140.00      0.00      0.00     18.36
  Vol:    905.58  19236.40  12117.17    482.74      0.00    917.56

Line 3        Data File: l2p00.bef
Template:     SubGrade: 1.00       SuperGrade: 0.00
```

You will see the same Total Cut Volume as in the End Area 1 Method. This report also includes V2P and V2NP values.

The V2P is the volume of material between the design and subgrade surfaces in the channel center where the design is less than the design surface.

The V2NP is the volume of material between the design and subgrade surfaces in the channel center where the design is greater than the design surface.

END AREA 3 METHOD

1. **Choose a Computation Method in the Survey Tab.** This time select End Area 3 method from the Method List.
2. **Enter X2 Left and X2 Right** equal to the distance inside the toes to make a box cut beneath the design surface.
3. **Calculate Volumes.** Select the Volumes Tab and the Volumes Tab will display the Volumes Report based on the information you have just entered.

FIGURE 7-12. *End Area 3 Volumes Report (Segment)*

```
Volume Report Plan: Olcott.css     Method: End Area 3 3/29/00 2:12:04 PM
Areas: Sq Meters, Volumes: Cu Meters


Volume Summary:

 DV1L:   8022.86  DV2L:   2315.39  DV3L:      0.00   X1L:   6759.87   X1R:   2111.55    Y1:
  DV1: 254506.07  DV2P:  19380.81   DV3:      0.00  DX2L:      0.00  DX2R:      0.00
 DV1R:   4077.15 DV2NP:    433.43  DV3R:     -0.00
                 DV2R:    753.55
_____________________________________________
Total: 266606.07         22883.18              0.00


Line 1        Pre-Dredge File: l0p00.bef Post-Dredge File: l0p00.aft
Template:     SubGrade: 1.00       SuperGrade: 0.00

  Area       V1L       V2L       V3L        V1       V2P      V2NP        V3       X2L
_____________________________________________________________________________________
    Y1      0.00      0.00      0.00      0.06      0.00      0.00      0.00      0.00
_____________________________________________________________________________________
   Pre      1.23      4.64      0.00     63.97    102.43      9.66      0.00      0.00
  Post      0.31      3.50      0.00     33.55     94.32      0.99      0.00      0.00
_____________________________________________________________________________________
 Delta      0.91      1.14      0.00     30.42      8.11      8.67     -0.00      0.00
    X1                                                                           3.50

Line 2        Pre-Dredge File: l1p00.bef Post-Dredge File: l1p00.aft
```

This report calculates the differences between the two surveys. It is does not easily compare to the other methods as far as the volumes calculations but you can see the report format. We have used files from the same survey area so if End Area calculations were done separately for each survey, the difference between the values found in each calculation would match the figures that you see here.

SAVANNAH METHOD

1. **Choose a Computation Method in the Survey Tab.** This time select Savannah method from the Method List.
2. **Calculate Volumes**. Select the Volumes Tab and the Volumes Tab will display the Volumes Report based on the information you have just entered.

FIGURE 7-13. *Savannah Volumes Report (Segment)*

```
VOLUME REPORT - SAVANNAH METHOD     PLAN: Olcott.css   RUN 3/29/00 2:16:54 PM
Areas: Sq Meters, Volumes: Cu Meters


DREDGING QUANTITIES SUMMARY
===========================
DEPTH=        12.00 AREA=      3108.45 VOLUME=    298188.54
DEPTH=        13.00 AREA=      4349.35 VOLUME=    408883.34
DEPTH=        13.00 AREA=      4349.35 VOLUME=    408883.34


DREDGING QUANTITIES CALCULATION
===============================
10+00        -118.00 TO 118.00
DEPTH=        12.00 AREA=        65.19 VOLUME=        0.00 ACC VOL=        0.00
DEPTH=        13.00 AREA=       181.93 VOLUME=        0.00 ACC VOL=        0.00
DEPTH=        13.00 AREA=       181.93 VOLUME=        0.00 ACC VOL=        0.00

11+00        -118.00 TO 118.00
DEPTH=        12.00 AREA=       356.15 VOLUME=    21059.54 ACC VOL=    21059.54
DEPTH=        13.00 AREA=       524.95 VOLUME=    35330.69 ACC VOL=    35330.69
DEPTH=        13.00 AREA=       524.95 VOLUME=    35330.69 ACC VOL=    35330.69

12+00        -118.00 TO 118.00
DEPTH=        12.00 AREA=       489.33 VOLUME=    42264.86 ACC VOL=    63324.40
DEPTH=        13.00 AREA=       647.31 VOLUME=    58600.03 ACC VOL=    93930.72
DEPTH=        13.00 AREA=       647.31 VOLUME=    58600.03 ACC VOL=    93930.72

13+00        -118.00 TO 118.00
```

The Total Cut Volume =298,188.54

TIN MODEL PROGRAM

The TIN (Triangulated Irregular Network) MODEL program creates surface models from XYZ or XYZid data files, or edited or sorted ALL format files. You can specify these files by naming a Catalog file (*.LOG) that contains them.

The TIN MODEL program creates a surface by connecting adjacent data points in optimized triangles. The model can be saved to a TIN File in your project directory.

It can be used for the following functions:

- **Creating two-dimensional and three-dimensional displays** of models.
- **Calculating volumes** by comparing the difference in elevation of each triangle node in the TIN Model, as it is projected onto the comparison surface -- a level, a channel or another surface.
- **Performing simple editing on your dataset**. The TIN Editor enables you to select and remove data, create break lines and trim the model to a border file.
- **Printing or plotting** two and three-dimensional models.
- **Exporting contours to DXF** HYPACK® options include color filling and smoothing.
- **Exporting XYZ files** based on user-defined options. You can export evenly spaced soundings from a single TIN or calculate the depth difference or average between two TIN models.
- **Filling Matrix Files** (*.MTX) with depth or Seabed ID information (or both). The TIN Model fills in between survey lines.
- **Cutting through surface models using a Planned Line File** to guide section location. You can calculate volumes by section using the Philadelphia method in TIN Model or export the sections to All format and use the data in Cross Sections and Volumes.

CREATING A TIN MODEL

1. **Start the TIN MODEL program** by clicking on its icon or by selecting FINAL PRODUCTS-TIN MODEL from the menu. The TIN MODEL shell will appear.
2. **Select FILE-NEW.** The Initial Data dialog will appear.
3. **Fill in the Initial Data dialog and click [OK].** Wait while the TIN is drawn to the screen. (See details in the Initial Data dialog section.)
4. **Save your settings. (optional)**
   a. **Select FILE-SAVE**.

b. **Select the *.INI file type and name your file.** You can later reopen this file to repopulate your Initial Data dialog with the current settings.

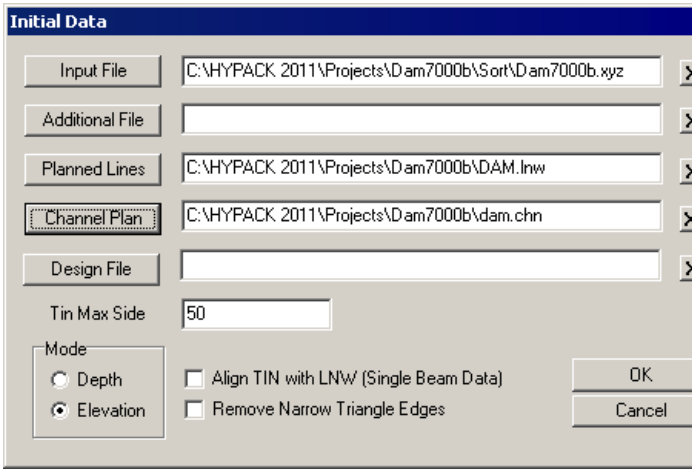
5. **Save the TIN Model. (optional)**
   a. **Select FILE-SAVE.**
   b. **Select the *.TIN extension and name it.** You can re-open this file by selecting FILE-OPEN and selecting the file. You do not have to wait for TIN Model to rebuild the model, but can immediately proceed to working with your model.

INITIAL DATA DIALOG IN TIN MODELING

The Initial Data Dialog contains all of the details necessary to make your TIN Model.

1. **Select FILE-NEW.** The Initial Data dialog will appear. This is where you will set which files will be used to accomplish your task in the program.

FIGURE 7-1. *Initial Data Dialog*



2. **Enter the data files necessary for your purpose**.
   - An **Input File** is required to create the model. Enter the name of:
     - An **ASCII XYZ** file, You can merge data from multiple XYZ files by using [Browse] then using the Alt or Ctrl key to select your files.
     - A **Catalog file (*.LOG)** of HYPACK® edited All format files.
     - Multibeam **HS2 files**.
     - A **Matrix File** (*.MTX). .

     For a pre-dredge vs post-dredge calculation, enter the pre-dredge data.

     In TIN-to-TIN volumes calculations, this is the TIN1 surface.

To export a Matrix file with Seabed ID information, enter an XYZid file, which can be created from your ALL format data in the SEABED MAPPER program.

NOTE: This matrix will store the Seabed ID information in the Survey Depth memory of the output matrix. Depth information will be stored in the Dredge Depth memory.

- **An Additional File** is required for doing TIN-to-TIN volumes calculations or comparisons. You can use any of the file types available for the Input file and the file types of the Input and Additional files do not need to match.

  For pre-dredge vs post-dredge calculations, enter the post-dredge data.

  In TIN-to-TIN volumes calculations, this is the TIN2 surface.
- A **Section File** is a Planned Line file containing single-segmented lines**.** The planned lines of the section file can be **superimposed** against the TIN model and sections created to either export All format information or calculate volumes using the Philadelphia volumes calculation mode in TIN MODEL.
  - **If you plan to export All format files**, the planned line file can be either 2-dimensional or 3-dimensional. The All format files can then be read in CROSS SECTIONS AND VOLUMES and other HYPACK® programs.
  - **If you plan to use the Philadelphia method** to calculate volumes, the planned line file must be 3-dimensional.
  - **TIN-to-Channel** volumes calculations require either a Channel File or a Section File. A Channel File(*.CHN) is created in the ADVANCED CHANNEL DESIGN program. The Section file is a Planned Line file (*.LNW) containing channel template information.
- **Channel Plan** is a CHN file created in ADVANCED CHANNEL DESIGN. It describes the channel template for a TIN-to-Channel volume calculation.
- **Design File** provides another surface to which you may compare your Input and Additional Files for volumes calculation purposes only. This field accepts the same data types as the Input and Additional File fields. When you calculate volumes, TIN MODEL will calculate the volume between this surface and TIN 1, this surface and TIN2 as well as between TIN1 and TIN2.
- **TIN Max Side** specifies the maximum allowable triangle leg distance. You should set this large enough so your data points connect, but not so large that points which have little relationship connect to each other. Start with about 150% of your line spacing. The TIN Model will not be created if this value is 0. The value of this field depends on the density of the input data. If

the value is too small, the final result will be an incomplete TIN. If the value is too large, the creation will be slow and, the TIN will probably contain triangles with very long legs.

- **Remove Narrow Edge Triangles**: At times, a large TIN Max Side may be necessary to fill gaps in the center part of your data, but this may create a series of long, narrow faces down the edge of your model. These can increase your model drawing time and will cause problems, if you import such a model into in the ENC EDITOR. This option avoids this type of problem by removing any triangles containing an angle of less than 2 degrees or greater than 176 degrees.
- **Mode: Inverts the Z** axis *only for the purpose of drawing***.**

Beware!

BEWARE! This option is *different than the "Invert Z" option* from HYPACK®. *Depth values are not inverted for export purposes.* To invert your data use the EXPORT program.

- **Align TIN with LNW** is only helpful with single beam data when the survey lines are not perpendicular to the bottom contour. It uses a modified formula that prevents anomalies in the TIN surface caused by crooked track lines. These differences are probably most noticeable at the edges of the contour models.

FIGURE 7-2. *Sample Portion of a Single Beam Survey File*

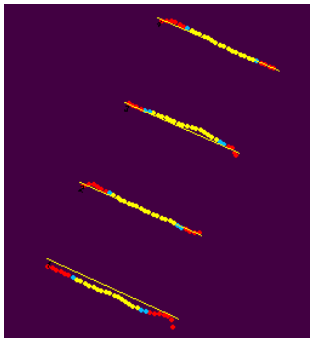


FIGURE 7-3. *Sample Files in TIN--Not Aligned*

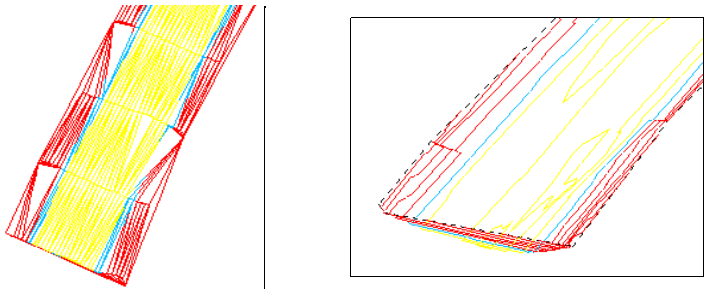
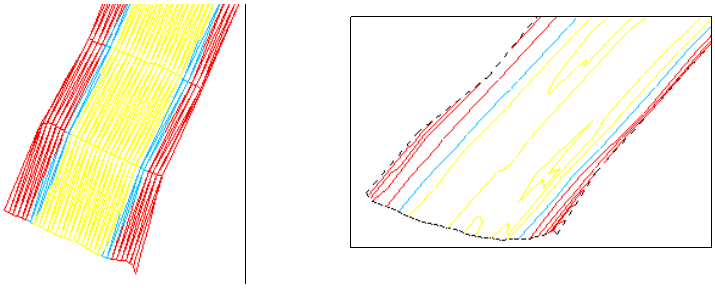


FIGURE 7-4. *Sample Files in TIN--Aligned*



3. **Click [OK]** and the TIN MODEL program will create the surface model of your Input Data file, and the Additional file if you have included one. The screen will show the progress of the model generation. You can stop the creation process at any time by clicking [Cancel].

TIN MODEL DISPLAYS

TIN MODEL offers several types of models and a selection of view options such as rotation, vertical scale and additional features to enhance your display. Each model is color-coded using project colors

You can draw multiple models and each model is drawn to its own window. Each window is drawn independently of any others so you can view the same model in several windows, using different model types or view options, and compare them side-by-side.

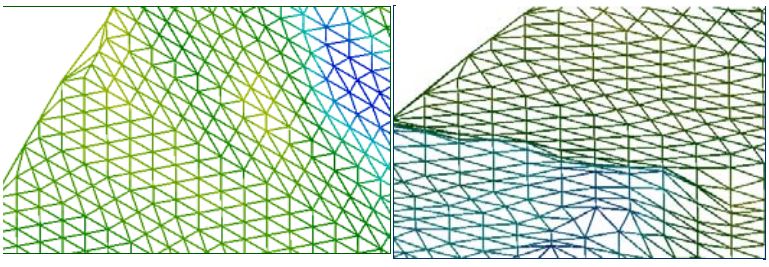
Hold the cursor over any 2D model and the XYZ coordinates at the cursor position will be displayed in the status bar.

TIN MODEL TYPES

TIN MODEL offers several types of models. Each model type can be drawn in two or three dimensions. Descriptions and examples of each follow:

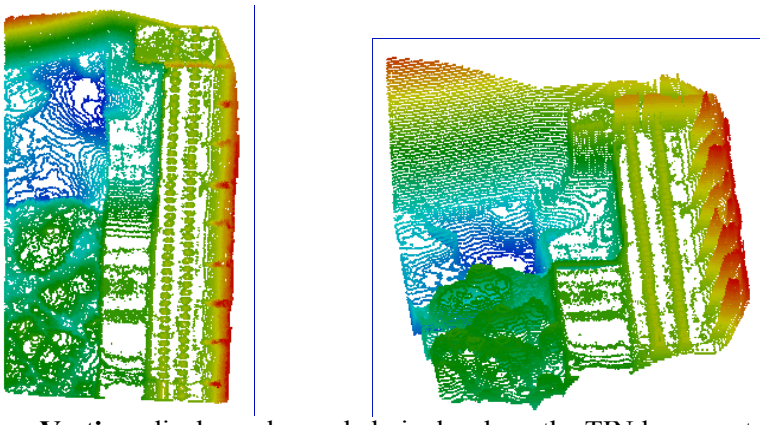
- **Wire frame** models show the color-coded triangulated web replicas of your sounding data.

FIGURE 7-5. *Wire Frame TIN Model--2D (left), 3D (right)*



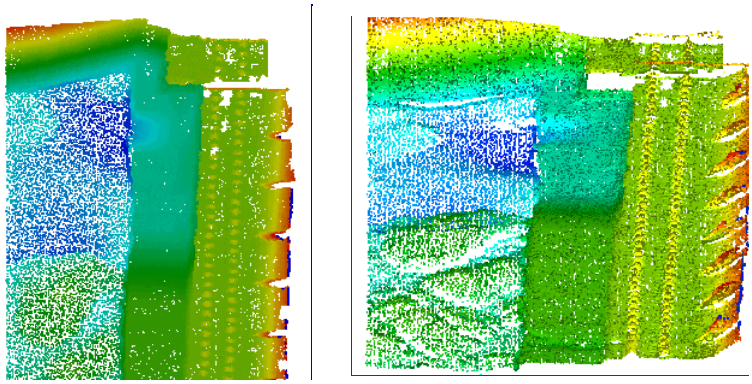
- **Contour models** draw contour lines using the colors and intervals set in the project colors.

FIGURE 7-6. *2D Contour Model (Left) and 3D Contour Model (Right)*



- **Vertices** display color-coded pixels where the TIN legs meet.

FIGURE 7-7. *2D Vertices (Left), 3D Vertices(Right)*



- **Filled** models are solidly colored representations of your survey area. The three-dimensional solid model is available in color and gray-scale, while the two-dimensional model is only in color.

FIGURE 7-8. *2D Filled3D Color*

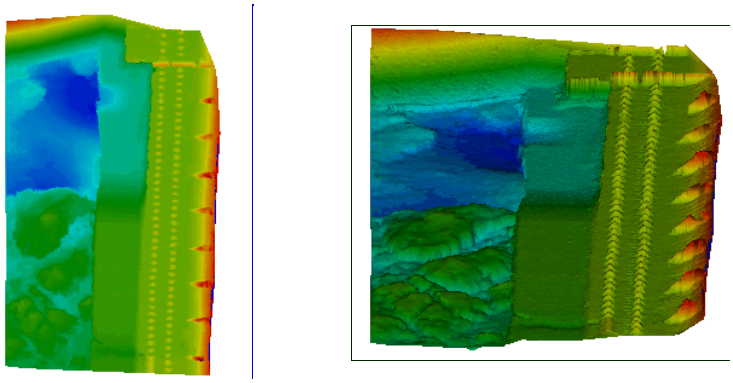
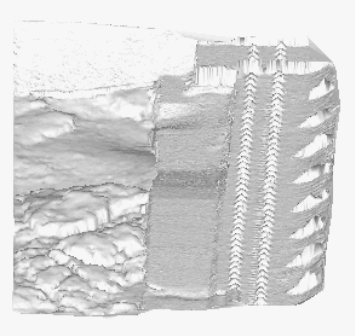
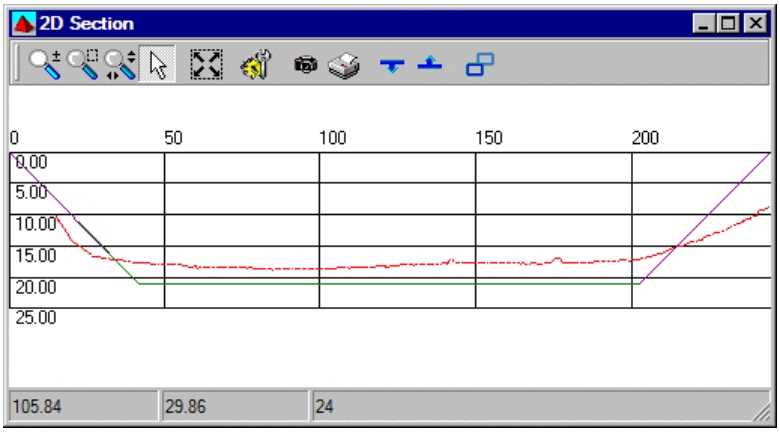


FIGURE 7-9. 3D Gray



Sections are simply model cross sections. The two dimensional models, show the vertical profiles along each line in the section file and you can scroll through the lines using the up and down arrows.

FIGURE 7-10. 2D Sections



A similar model can be drawn by clicking the Instant profile icon and dragging the cursor across the model where you want to view the profile. In this case, no other profiles are viewable.

The three dimensional models can be drawn either vertically according to the section file or horizontally according to contour levels described in the current project color settings.

FIGURE 7-11. 3D Horizontal Sections --Levels

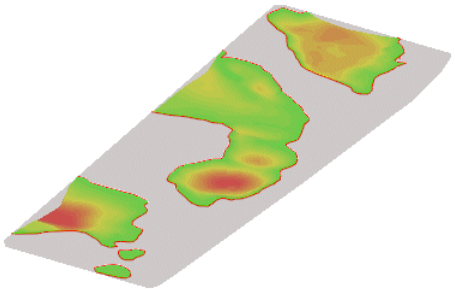
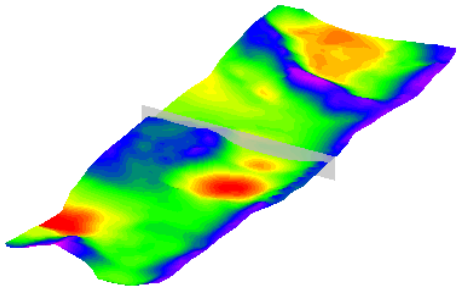


FIGURE 7-12. 3D Vertical Sections--Profiles



TIN VIEW OPTIONS

Each model display window includes a toolbar with controls that affect only that model. Some tools are present in each window while others vary according to what is appropriate for 2D, 3D or Sections displays

The standard **zoom tools** appear in each window. You can also use your mouse and keyboard commands to adjust your display. A complete set of commands can be displayed by selecting HELP-SHORTCUTS.

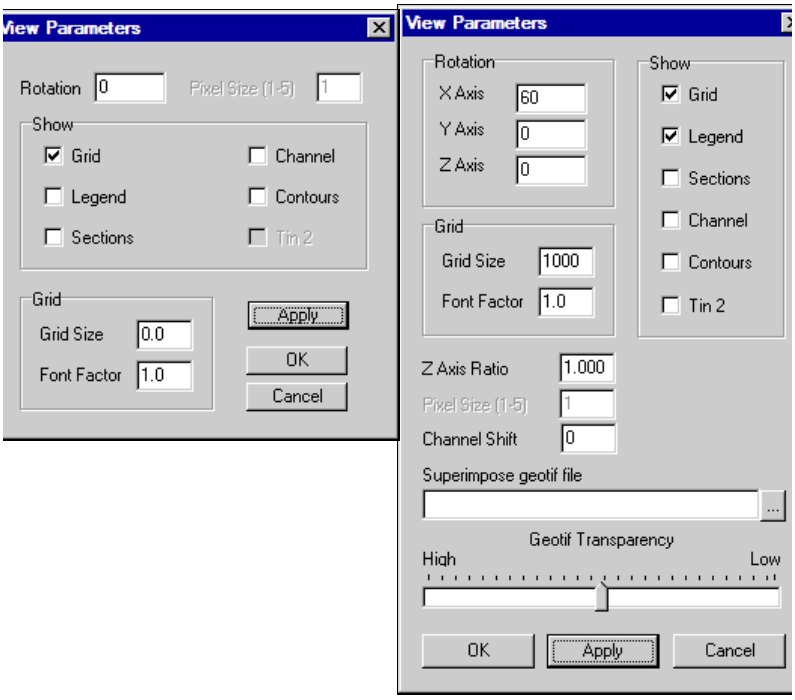
The **Clone** Tool is available creates a new window with the same model and settings as the one where you clicked the icon. It might be useful to do this, then modify certain settings for comparison to the original view.

The **Setup Icon** appears on the toolbars of all model types. This icon or F9 accesses a dialog where additional view options are provided.

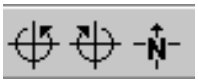
2D AND 3D MODELS

Many of the view options apply to both 2-dimensional and 3-dimensional models. Three-dimensional models have additional view options. In each case, only the options appropriate for the model type in that window will be enabled.

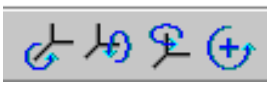
FIGURE 7-13. *View Parameters in the TIN program 2-dimensional model options (left) and 3-dimensional model options (right)*



The **Rotation** angles rotate the model counter-clockwise around the imaginary center of the model. These settings are can also be modified by using the rotation icons on the toolbars.



2D models can be rotated in either direction around the Z axis. North Up is a rotation of zero degrees.



3D models can be rotated in either direction around any or all of the axes. Click the right-most icon of the group to select the direction of rotation. The other icons rotate your model around the X, Y and Z axis respectively.

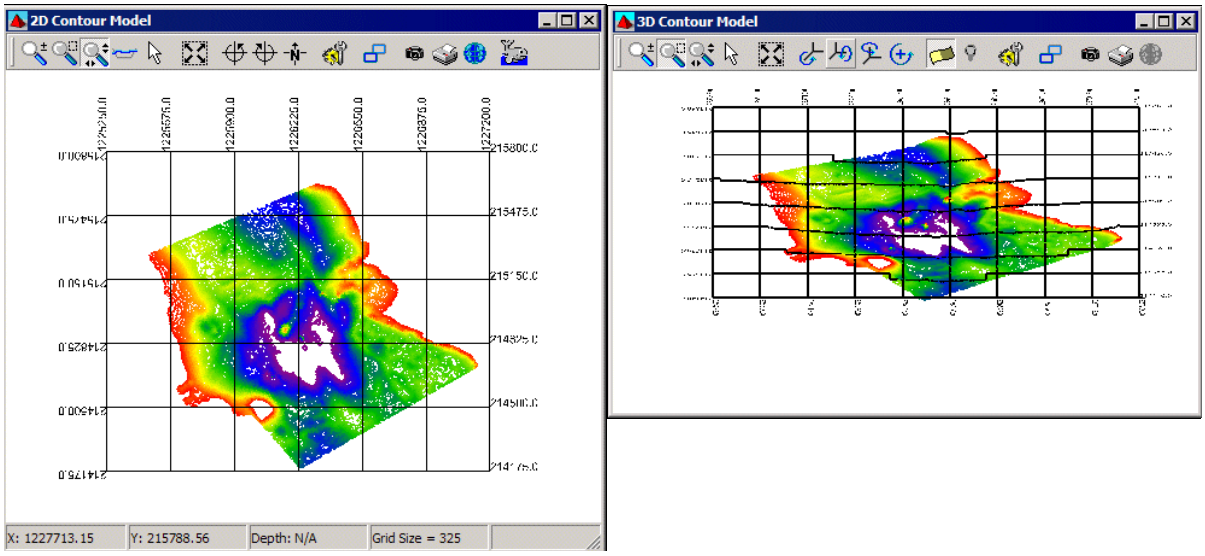
The **Z-Axis Ratio** stretches or shrinks the data along the Z-axis. The TIN Model already builds in some exaggeration. This can be amplified by the number in this entry.

Pixel Size determines the size of the soundings in the Vertices models.

Grid displays a grid with the model to give you a little more perspective. **Grid Size** defines the spacing between the grid lines or, if the grid size value is set at zero, the distance equals the Maximum TIN Leg specified in the Initial Data dialog.

To adjust the size of the grid labels, enter a **Font Factor** value. Values greater than 1 increase the font size, while values between 0 and 1 decrease the font.

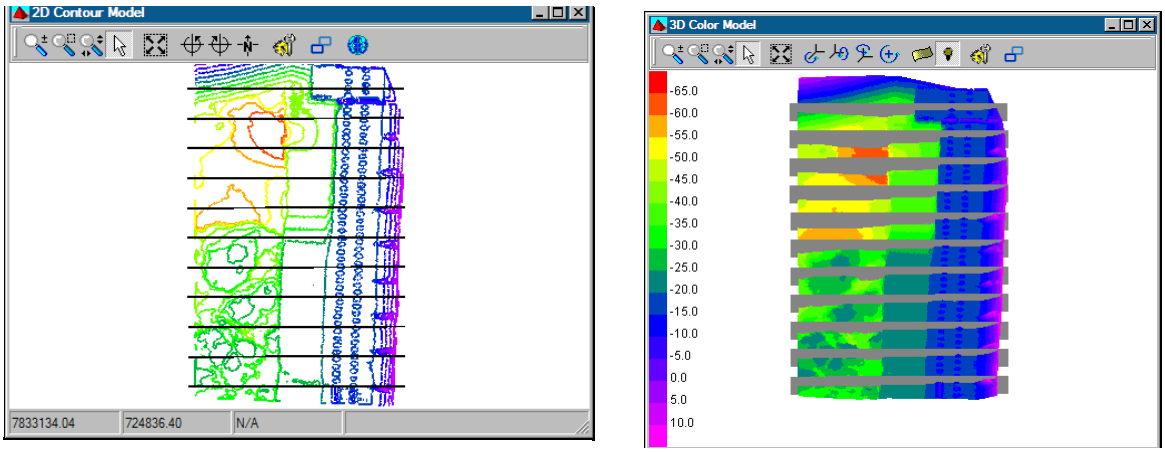
FIGURE 7-14. 2D (Left) and 3D (Right) Models with Grid Overlaid



Legend shows a color-coded depth legend for models that are color filled or color-contoured.

Sections: If you have created the TIN with a section file, this option displays the Planned Line file superimposed on the 2D TIN Models and cutting the 3D models. Section models offer several options which will be discussed shortly.

FIGURE 7-15. 2D (Left) and 3D (Right) Sections



Channel displays a CHN file, created in ADVANCED CHANNEL DESIGN, with the TIN Model of your sounding data.

TIN2 allows you to choose the surface to draw with the options in the Model menu. Show TIN2 is only available when you are doing TIN-to-TIN calculations.

Additional Options for 3D Models include the following:

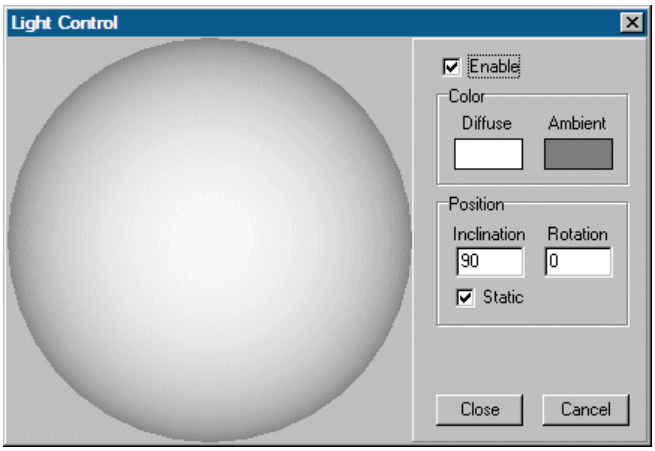
- **Channel Shift** raises and lowers the gray channel model up and down in the TIN model display**.**

- **Superimpose geo-tif file** enables you to overlay a geo-referenced TIF image on the TIN model. Click the ellipsis button and browse for the required file. When the TIF image is overlaid, it obscures the TIN model. You can view the TIN model through the TIF by adjusting the geo-tif transparency with the slider.
- **Lighting Effects:** Two icons on the tool bars of 3D models affect changes in lighting effects.

  The **Light Icon** is available only for three-dimensional models. It launches the light control where you can enable/ disable the light feature, and set the color and position of your lighting for optimal viewing of your model.

  If the '**Enabled'** box is checked, the lighting in the Light Control, as well as in your model window will update according to each setting change.

FIGURE 7-16. *Light Control*



Color: Click on either color block to access a color dialog where you can select your favorite color for each option.

- **Diffuse** color comes from the light source.
- **Ambient** sets the color of the light that brightens the entire display. It is similar to the brightness setting in your favorite graphics program.

Position:

- **Inclination** is the angle of the light relative to the horizon.
- **Rotation** is the position around the Z-axis of the model.

Together they describe the exact position of the light source relative to the model.

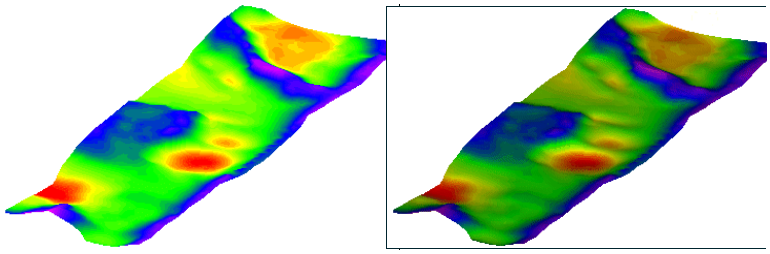
Rather than puzzling out what the angles should be, you can imagine that the shape on the left is your TIN model then uses your cursor to click where you would like the light source to be positioned relative to your model.

If the **Static** option is checked, the light source will remain stationary as you manipulate your model in the window. This setting accentuates the

contours in your data because the light and shadows change as you rotate the model.

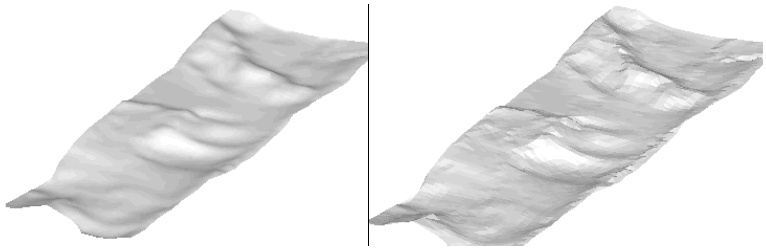
If Static is cleared, the light will maintain its position relative to the model so the same side will always remain lit in the same manner.

FIGURE 7-17. *Light Enabled (left), Light Disabled (right)*



The smooth icon softens the angles in the drawings.

FIGURE 7-18. *Smooth On (left) and Smooth Off (right)*



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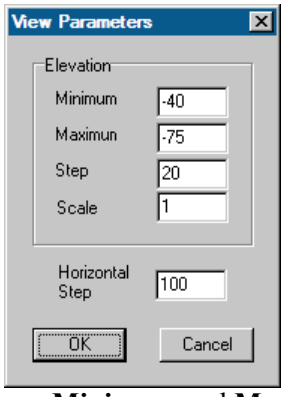
SECTIONS SETUP

Sections models have such different options a different setup dialog is required.

Two dimensional models, show the vertical profiles along each line in the section file. The Setup dialog provides options for scaling the display.

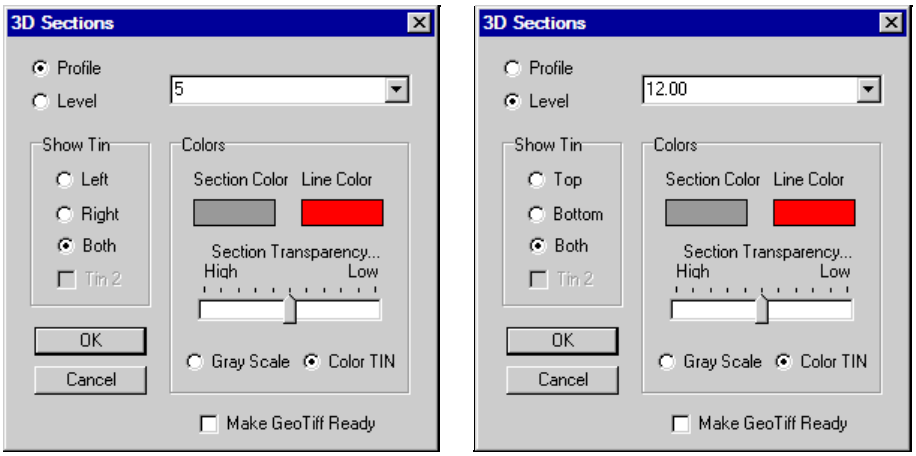
FIGURE 7-19. *Setup Dialog for 2D Sections*



- **Minimum** and **Maximum** Elevation set the vertical range.
- **Step** determines the distance between horizontal lines in the graph.
- **Scale** modifies the Z-Scale of the graph.

Three dimensional models are drawn either vertically along the survey lines in your Section file or horizontally according to the levels defined in your color settings. The cut is represented by a planar surface drawn through the model.

FIGURE 7-20. *Setup Dialog for 3D Sections*



When you make that choice by selecting "**Profile**" or "**Level**", other options in the dialog adjust to coincide.

If you have selected "Profiles":

- The drop-down list will be populated with line names and you may select at which section the model should be cut. You can use the up and down arrows to shift the cut in either direction one line at a time.

- The Show TIN options, and the corresponding icons on the tool bar, allow you to display the portion of the TIN to the left, right or on both sides of the section line.

FIGURE 7-21. *TIN Sections—Both Sections*

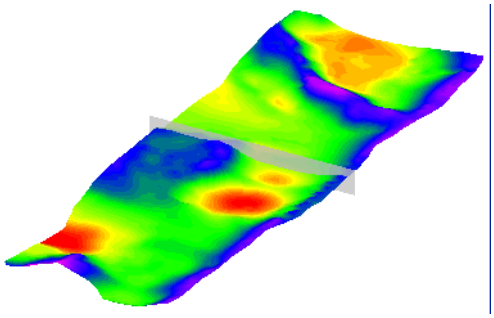
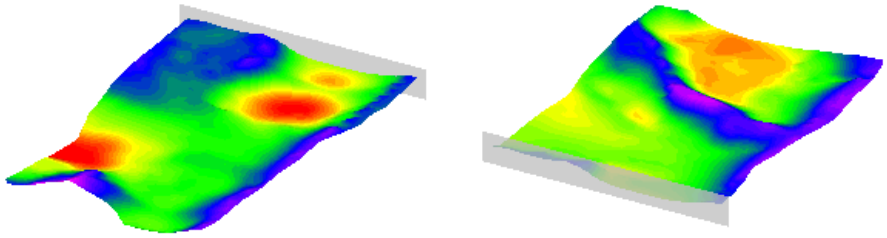


FIGURE 7-22. Right (below left), and Left (below right)



If you have selected "Level":

- The drop-down list will be populated with levels and you may select at which level the model should be cut. You can use the up and down arrows to shift the cut in either direction one level at a time.

- The Show TIN options, and the corresponding icons on the tool bar, allow you to elect to display the portion of the TIN to the above, below or on both sides of the selected level.

FIGURE 7-23. TIN Sections—Both Sections

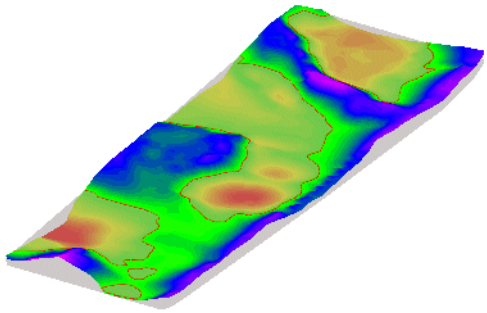
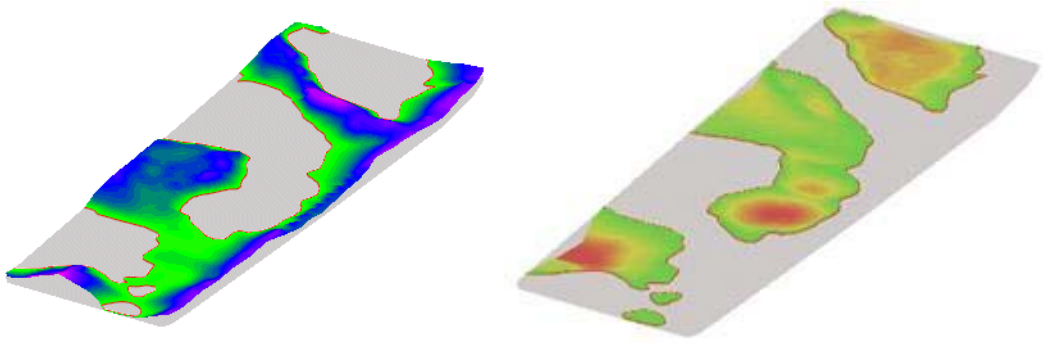


FIGURE 7-24. Top (left), and Bottom (right)



A contour line is drawn at the selected level. The **Line Color** defaults to red, but you can customize the color by clicking the corresponding square and choosing from the color dialog that appears.

The **Section Color** defaults to gray, but you can customize the color by clicking the corresponding square and choosing from the color dialog that appears.

The **Section Transparency** is set with the slider. High transparency makes the plane invisible while a low setting makes it opaque.

NOTE: When you are drawing horizontal sections, low transparency can mimic the "Top" option under "Show TIN".

Make Geo-Tif Ready resets all rotation angles to zero, which is required for TIN MODEL to generate a geo-referenced TIF image from your model.

TIN COLORS

To modify the project colors, select MODIFY – COLORS or click the Colors icon on the tool bar. The standard Color Dialog will appear. The new colors will be used to draw your TIN models and to update your project colors when you exit TIN MODEL.

More Information

- "Sounding Color Settings in HYPACK®" on page 1-34

MODELING SEABED IDENTIFICATION VALUES

If you build the TIN model using an X, Y, Z, ID file, TIN MODEL will draw the model using seabed identification values..

To display your data using seabed identification colors:

1. **In SEABED STATISTICS or SEABED MAPPER, export your data to XYZId format**.
2. **In SEABED STATISTICS, export the seabed ID colors to a HYPACK® Color file (*.HCF)**.
3. **In HYPACK®, load the Seabed HCF file as your project color file**.
4. **In HYPACK®, set the matrix to display either Survey Depths or Seabed ID**. Either will work.
5. **In TIN MODEL, TIN your seabed ID values by using your XYZId file as the input file**.

Since you have loaded your seabed colors as your project colors, your color TIN models should draw in seabed colors. Likewise, if you export your TIN data and display it in the HYPACK® map, it will be color-coded according to your seabed colors.

More Information

- "Exporting Seabed Data to a Text File" on page 8-192
- "Seabed Identification in Mapper" on page 4-68
- "Converting Seabed Identification Colors to Project Colors" on page 8-193
- "Matrix File View Options in HYPACK®" on page 2-255

Measuring Distance and Position in 2D TIN Models

In the two-dimensional models, you can use the cursor to:

- **Determine the XYZ of any position in the model.** Point the cursor at the place of interest and the coordinates will be displayed in the window status bar.
- **Measure distance and azimuth between two points.** Click and drag the mouse from one point to another. The distance and azimuth of the path between them is displayed in the status bar.

Editing your TIN Model

The new TIN Editor provides flexibility in editing the data in your TIN model. The Trim TIN and Break Lines features, which are now part of the TIN Editor function, are further enhanced by:

- A choice of cutting methods
- The ability to perform multiple cuts simultaneously in one operation
- The tools to manually define cuts in addition to the previous methods of trimming to a border file and using a planned line file to guide breaks.

The general process is very straight forward:

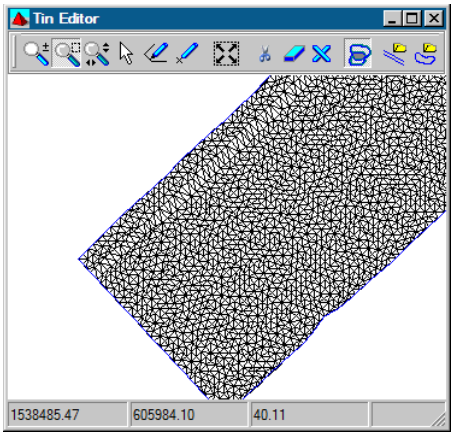
1. **Open the TIN Editor by selecting MODIFY-TIN EDIT**.
2. If you will be defining more than one polygon, **choose Union or Intersection Mode.**
3. **Mark the triangles that will be cut.**
4. **Perform the cutting.**

Each combination of the above enhancements give you different results depending on the choices you have made.

THE TIN EDITOR INTERFACE

When you access the TIN Editor, a separate window with its own tool bar and a black wire frame model is created for TIN editing.

FIGURE 7-25. *TIN Model Displayed in the TIN Editor*



You will find the standard Zoom, Pan and Selection tools found on most HYPACK® tool bars to adjust your view of the model in the window below it. If your model is large, it will probably be useful to zoom in and center on the area where you will be editing.

Zoom in/out allows you to zoom in/out quickly with just a click of the left/right mouse button.

Zoom Window allows you to focus an area of interest

Center allows you to select the new center of the model.

Arrow is the default. It does not give you any additional action. It tracks mouse movement and displays its world position and the model depth/elevation at the cursor location in the status bar.

Zooms Extents of the model.

There are several additional tools that are used to mark and cut your model. Descriptions are included in the following sections.

CHOOSING UNION OR INTERSECTION MODE IN THE TIN EDITOR

If you want to trim your TIN with only one polygon, your choice of Union or Intersect mode is irrelevant; it only works where you load multiple polygons.

If you load more than one polygon, your outcome will be different depending on which of these modes you choose.

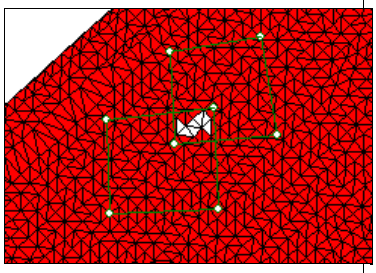
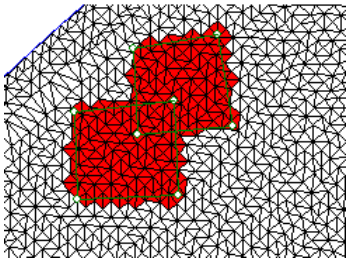
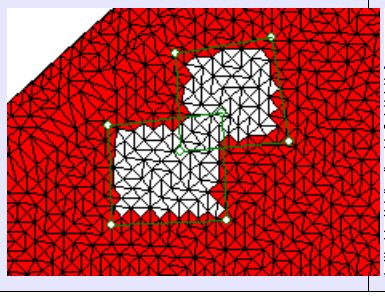
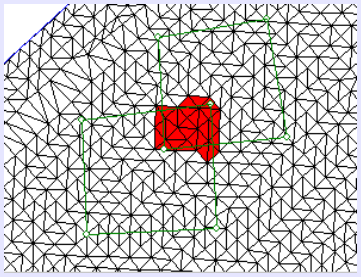
NOTE You must make this selection *before* creating your polygons.

The Union Mode icon toggles between the two modes.

- **Union Mode** selects all triangles selected by any of your polygons.
- **Intersect Mode** selects only triangles that are selected by all polygons.

The following figures illustrate each mode and how the saved area designated by the border affects the results

TABLE 7-1. *Trimming a TIN Model to a Border File - Union Mode vs Intersect Mode*

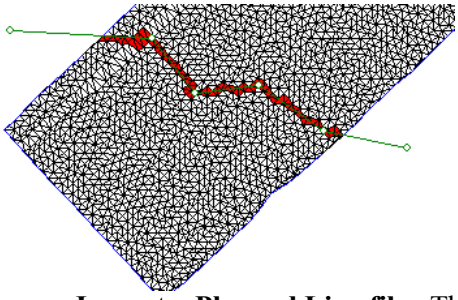
	Before Trimming	After Trimmiing
Union Mode		
Intersection Mode		

CUTTING BREAK LINES IN YOUR TIN MODEL

Break lines are lines that TIN legs will not cross. You can define these lines manually with the Polyline/Polygon Pen or by importing a Planned Line file. These lines are then used to edit your model to remove certain areas from your model and volumes calculations that might not be eliminated by the TIN Maximum Side.

1. **Mark your lines**.
   - **Manually**:
     i. **Click the Pen icon**.
     ii. **Define the break line** by clicking at each waypoint.
     iii. **End the line** by clicking the default Arrow icon.

FIGURE 7-26. Sample Line Overlaid on the TIN Model

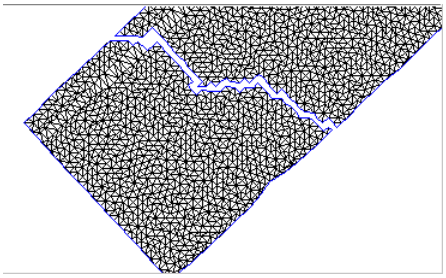


- **Import a Planned Line file**. The file can contain one or more, single or multi-segmented lines. This feature does not support curved lines.
  i. **Click on the LNW Import icon**.
  ii. **Select your line file** from the File Select dialog and click [OK].

NOTE If you are not satisfied with your selections, you can clear all selections and begin again by clicking the Clear Selection Icon.

2. **Cut your Model by clicking the Eraser icon**. All triangle legs that intersect with the selected line file will be removed from your model.

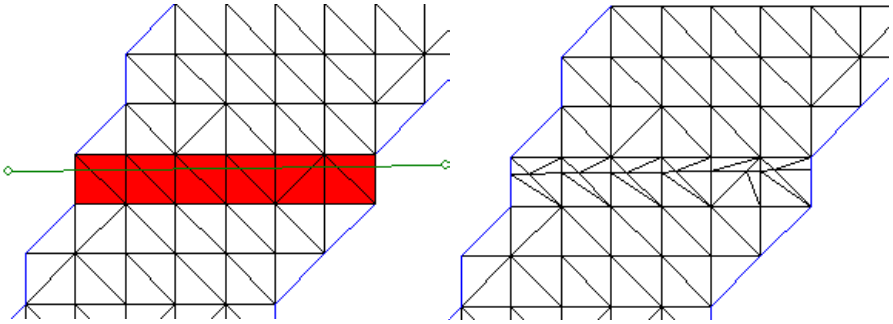
FIGURE 7-27. Break Line Data Removed with the Eraser Icon



BREAKING A TIN MODEL

When you break a TIN Model, all of the faces crossed by a user-defined boundary subdivide to include the boundary. This is different than cutting break lines which removes the triangles crossed by the border creating a void. When you break a TIN model, no void is created.

FIGURE 7-28. Breaking a TIN Model - Before (left) and after (right)



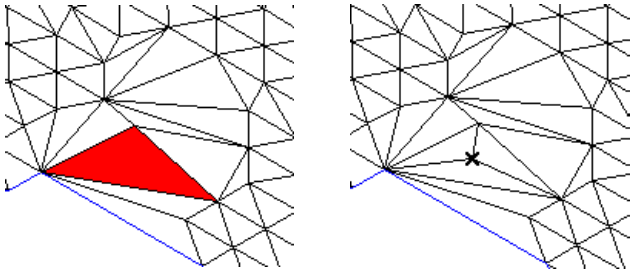
1. **Use the polygon pen to define the boundary**. This feature works with either an open or closed polygon.
2. **Select the default icon** to select the triangles.
3. **Click the Break TIN icon.** The results are draw to the TIN Editor screen.

BREAKING A TRIANGLE

Use the Break Triangle tool to divide any triangle in your TIN model into three parts. Each part will be defined by two existing vertices and the cursor location.

1. **Click the Break Triangle tool.** The cursor changes to an 'X'.
2. **Click in the triangle you want to break** at the location where the three parts should meet.

FIGURE 7-29. Breaking a Triangle - Shaded Triangle to be Broken (left), Results (right)

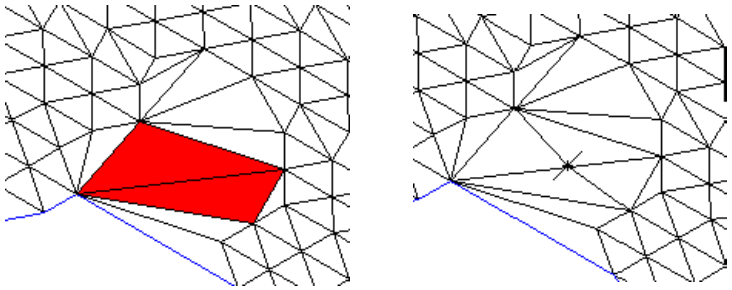


SPLITTING TIN MODEL LEGS

The Split Leg tool divides the triangles on either side of a selected TIN model leg. In each triangle, it generates an additional leg from the cursor location to the opposite vertex.

1. **Click the Split Leg tool.** The cursor changes to an 'X' on a bar.
2. **Click on the leg you want to break** at the location where you want to divide the leg (and its associated triangles).

FIGURE 7-30. *Splitting a Leg - Leg in Center of Shaded Triangles to be Split (left), Results (right)*



TRIMMING YOUR TIN MODEL TO A BORDER

You can clip TIN models to fit an area defined by a border.

This feature is useful to calculate volumes for only a defined portion of your survey area. It may be *necessary* if your TIN Max leg crosses an area that should not be included in your model. This can occur where:

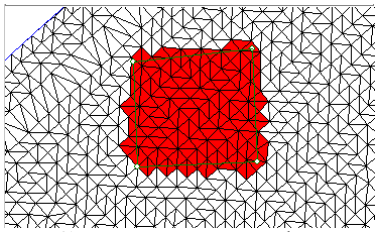
- There are areas such as small islands or bridge footings.
- Survey lines curve so sharply that the TIN legs may cross the land area inside the curve.

3. **Mark your areas**.
   - **With the Polygon Pen.** Click points around the border, then right inside or outside the area where you want to save your data.
   - Magic Wand Icon**With the Magic Wand.** Click each triangle where you want to remove data. This is designed be used for small scale editing, where your triangles are very large or when you have an abundance of time and patience.
   - BRD Import Icon**Import a Border file**. If you have a Border file that defines the area you want to clip, click **on the BRD Import icon** then **select your line file** from the File Select dialog and click [OK].

     In either case, you should see the areas superimposed on your model and the affected triangles marked with red fill.

NOTE: If you are not satisfied with your selections, you can clear all selections and begin again by clicking the Clear Selection Icon.

FIGURE 7-31. Sample Border Overlaid on the TIN Model

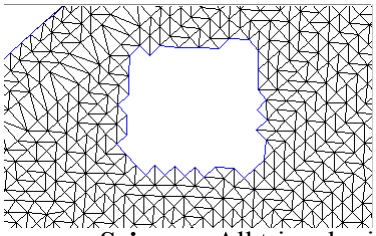


4. **Cut your Model.** There are two tools that cut your data. Each has slightly different results.

NOTE: If you have selected triangles with the Magic Wand, you must remove the data with the Eraser.

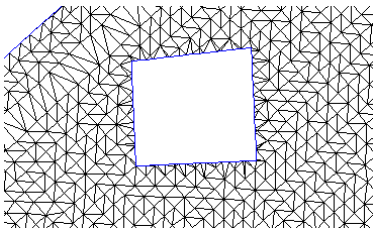
- **Eraser Tool:** All triangle legs that intersect with the selected border file, and those inside or outside the border as designated by the right-click, will be removed from your model.

FIGURE 7-32. Erasing TIN triangles leave irregularly jagged edges.



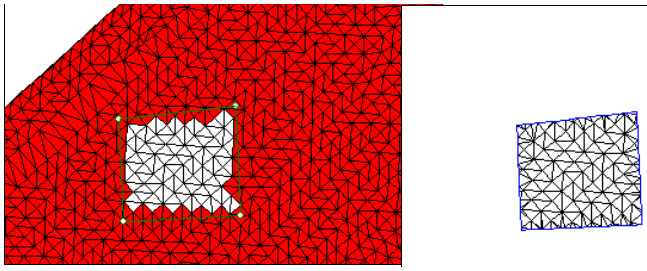
- **Scissors:** All triangles inside or outside the border will be removed. The edge of the model on the cut line will be reconfigured to create a clean edge.

FIGURE 7-33. Cutting the TIN creates smooth cut edges.



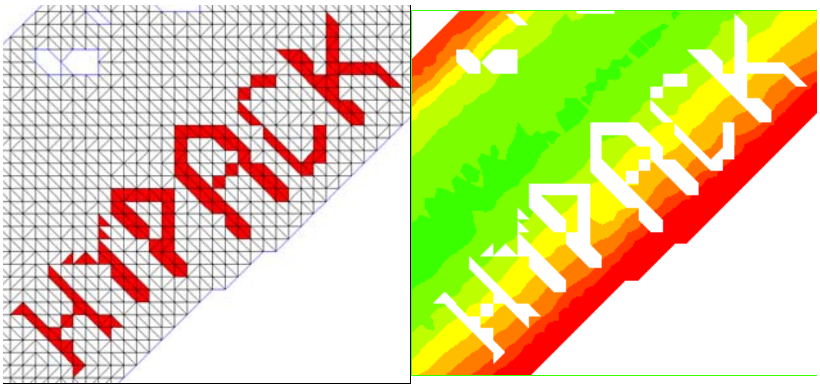
This illustration used a border where the data outside was saved. A similar edit may be done using a border where the data *inside* is saved.

FIGURE 7-34. *Clipping your TIN Saving Data Inside the Border*



And this can be done with the Magic Wand.

FIGURE 7-35. *Editing with the Magic Wand*

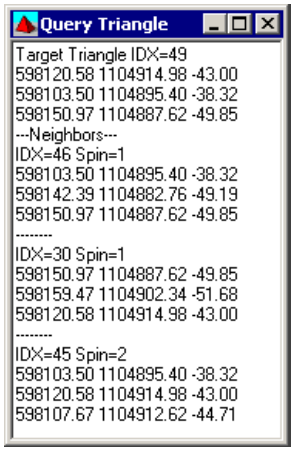


QUERYING YOUR TIN MODEL IN THE TIN EDITOR

The Query Triangle tool in the TIN Editor reports the XYZ coordinates of each node for a triangle selected in the model as well as each of the surrounding triangles.

1. **Click the Query Triangle icon.** The cursor will become a question mark.
2. **Click the triangle in which you are interested.** The Query Triangle window appears to display the report.

FIGURE 7-36. *TIN Query Results*



EXPORTING DATA FROM TIN MODELS

The EXPORT menu accesses the dialogs used to create final products from the TIN MODEL program. From these dialogs, you can produce:

- Section files in All format, DXF or XYZ format where the planned line (section) file crosses the TIN model.
- XYZ files
- DXF contours
- A screen capture to the printer or plotter
- Filled matrix files
- Border files surrounding your data set
- Simple channel files
- TIN Model reports

CUTTING SECTIONS THROUGH A TIN MODEL

The TIN MODEL program can be used to cut sections through any data set. The sections are cut along the lines of a Planned Line file loaded as the Sections file:

- **In the Initial Input dialog** when you first build the model.
- **Using the MODIFY-SECTIONS menu** option.

The Sections file can be either two- or three-dimensional depending on the purpose for the sectioned data. In most cases, it the lines must be single-segmented (two waypoints define each line).

Once your model has been constructed and a Section file designated, you can:

- **Export sounding data along the survey lines** to All, XYZ or DXF format. The All format and DXF routines are described this section.
- **Calculate volumes by the Philadelphia method**.
- **View the TIN model with the sections** overlaid. The section file can be either two or three-dimensional.

ALL FORMAT EXPORT FROM TIN MODELS

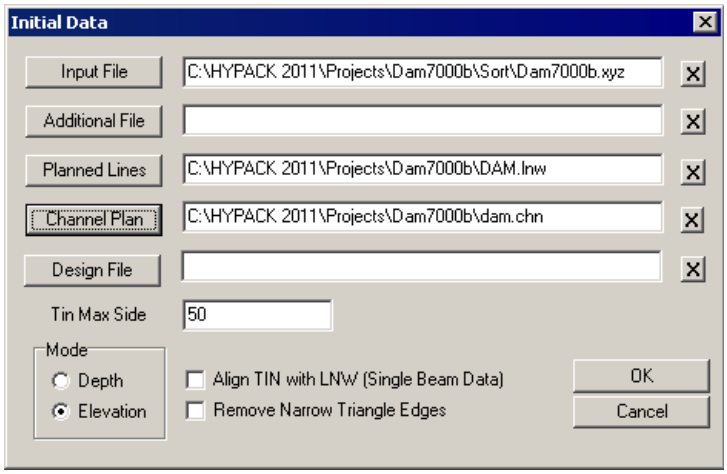
To export All format files, the Section File must be single-segmented. If it is also three-dimensional, the All format data will include the channel template information in the header. TIN Model creates an XYZ data point at user-defined intervals along your survey lines and saves them to an All format file in your Edit Folder.

The All format files can then be read in the CROSS SECTIONS AND VOLUMES, HYPLOT and EXPORT programs. This is an easy way to associate a new channel to your existing data file.

1. **Start the TIN MODEL program** by clicking on its icon or by selecting FINAL PRODUCTS-TIN MODEL.
2. **Select FILE-NEW**.

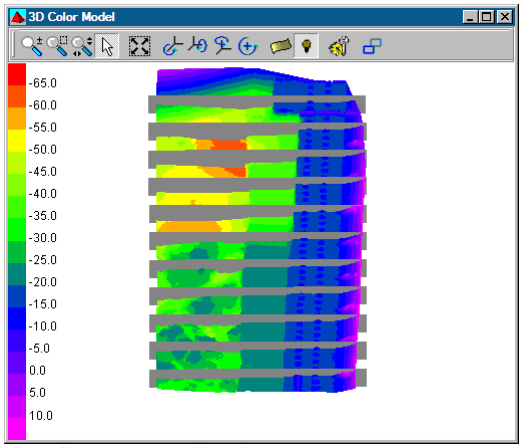
3. **Create a TIN model including a Sections file.** In the Initial Data dialog:
   - Click on the **[Input File]** and select the data file.
   - Click on **[Section File]** and select the Planned Line file.
   - Enter a **TIN Max Side** of 60.
   - Click **[OK]** and the TIN Model will be generated.

FIGURE 7-1. *Defining your TIN in the Initial Data Dialog*



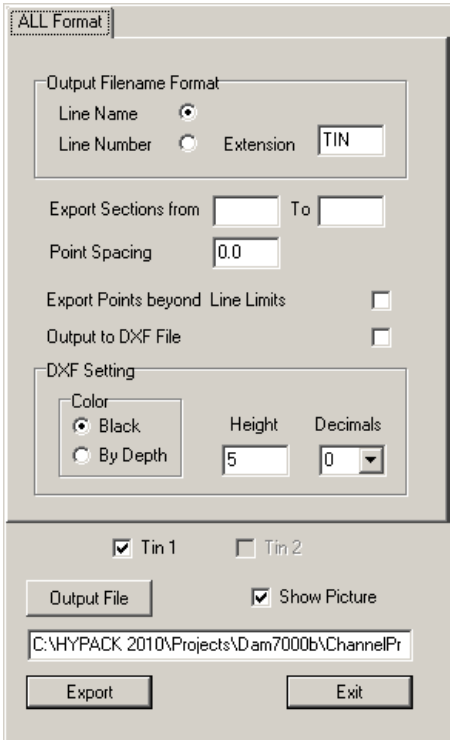
You can view your model with the sections by selecting the "Show Sections" option in the 2D or 3D model set up, or by creating a Sections type model.

FIGURE 7-2. *Viewing TIN Sections in a 3-Dimensional Model*



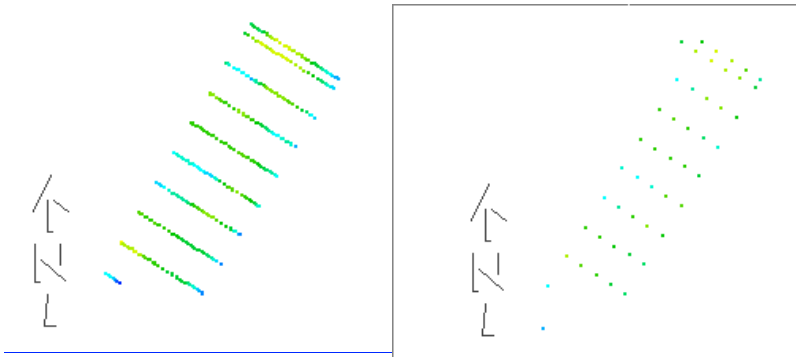
4. **Create the Sections.**
5. **Select EXPORT-ALL FORMAT**.

FIGURE 7-3. *Export ALL Format Dialog*



6. **Select Output File Name Format.** If you created the LNW file in CHANNEL DESIGN, select "Use Line Name", otherwise, "Use Line Number".
7. **Set your File Extension**. The File Extension defaults to "TIN". So the files derived from the line file will be named with the format Line_Name.TMD in the exported file. You may choose any another extension if you wish.
8. **Set the sections to be exported.** "**From**" and "**To**" default to the first and last section (or planned line) of your file. You may export only a portion of your file by specifying the range of sections here.
9. **Set the Point Spacing** (Optional). This is the distance that will be between points in the resulting ALL format file. If point spacing equals 0, TIN MODEL will generate a point at each place where the line file intersects with a TIN MODEL leg.
10. **Click on [Output File] and name the new file** (with the path) in the dialog provided.
11. **Choose whether to watch the export progress. I**f you check "**Show Picture**", an image representing the export progress will be drawn in the panel on the right. It's a nice visual but it takes more time for the export to be completed. If your data set is very large, you may want to optimize the export speed by clearing this option.
12. **Click [Export]** and your files will be exported, by default, to the Sort directory. You can see the results by enabling them in the main HYPACK® window.

FIGURE 7-4. *Reviewing the New Files in the Main Window—Point Distance = 0 (left), Point Distance = 50 (right)*



EXPORTING SOUNDINGS ALONG A LINE TO DXF

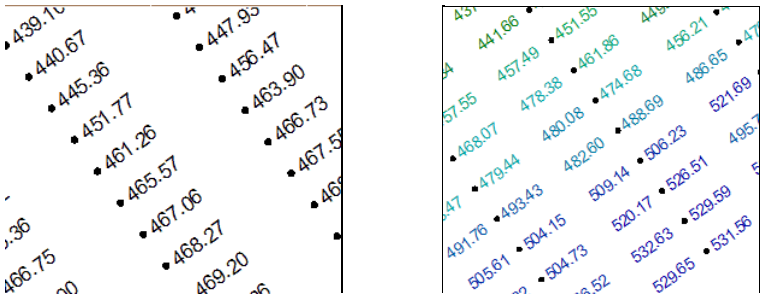
You can generate a DXF file with soundings at user-defined intervals along each line of a Section file. The line file can be either 2- or 3-dimensional, and may be multi-segmented.

The soundings are output in the Russian format. The sounding location is marked with a dot with the sounding value from the Input file to its right. If you have a second TIN, the depth from the Additional file appears left of the sounding position.

1. **Select EXPORT-ALL FORMAT**.
2. **Check the Output to DXF File option**.
3. **Set the DXF options**:
   - **Color:** By Depth uses your project color scheme. Note, for best results, your color scheme should use either the DXF Colors or DXF Spectrum settings.
   - **Height** (in scaled survey units) of your text
   - **Decimals:** You can output up to four decimal places.
4. Set the **Point Spacing**. This is the distance between the exported soundings. Point spacing greater than zero must be entered for this type of export..
5. **Name the Output File** by clicking [Output File] and entering a name. The program will include the path in the field below.
6. **Click [Export]**.

Load the resulting DXF file in the HYPACK® screen to see the results.

FIGURE 7-5. *Russian Format - One TIN Model (left), Two TIN Models (right - Input File right and Additional File left of the Sounding Point)*



XYZ Export from TIN Models

The TIN MODEL program can extrapolate XYZ data from a TIN model and export it, typically to your project's Sort folder. The values exported vary according to your choice of XY Source, Z Source and whether you have included an Additional File in your TIN Model.

- **XY Source** determines how the horizontal positioning of the points will be generated.
- **Z Source** determines what the reported Z value will represent.

To export to XYZ, select EXPORT-XYZ.

- "Export XYZ Data from Single-Surfaced TIN Models" on page 7-138
- "TIN-to-Channel Comparisons" on page 7-139
- "TIN-to-TIN Comparisons" on page 7-140

Export XYZ Data from Single-Surfaced TIN Models

If you have created your TIN model with only one data file—the Source File-- the Z Source is always "TIN". The results vary according to the XY Source.

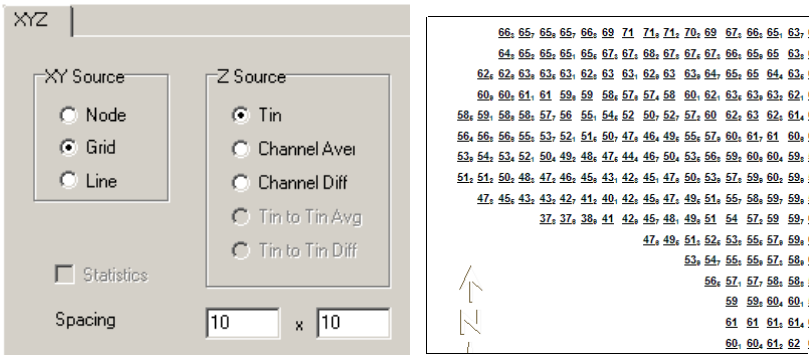
NOTE: If you have two TIN surfaces, designate which TIN surface to use in the calculations by checking the TIN1 or TIN2 check box.

Grid Export

The program creates grids with user-defined cell dimensions then exports one record for each node in the grid. This results in regularly spaced sounding data in your exported XYZ file.

You can use this gridded data to create a new, gridded TIN model. At times, these may be advantageous over regular models. They may create more quickly and usually create smoother contours. Remember, however, that you may lose some accuracy in the gridding process because the depths are calculated. Gridding can "average out" small contour changes from your original data set. This becomes more likely in larger the grids.

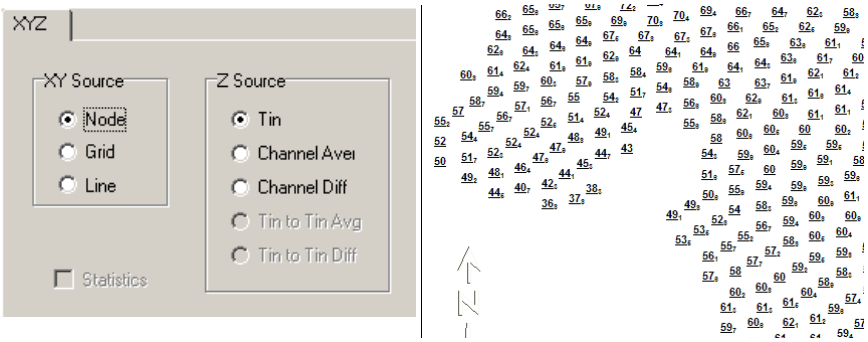
FIGURE 7-6. *Sample Grid Export*



Node Export

The program exports one record for each node in the TIN model. The soundings are not regularly spaced, but the Z values are the actual sounding values; they have not been calculated. This is one way to extract XYZ data from All format or matrix files.

FIGURE 7-7. *Sample Node Export*

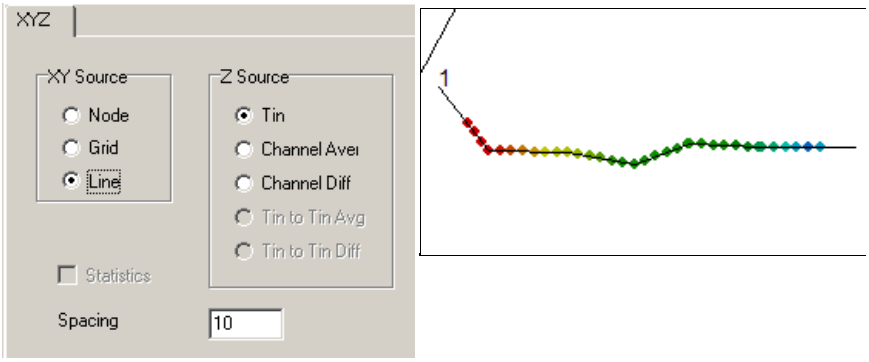


Line Export

The program creates XY points along the lines in your Section File using a user-defined distance. It then takes the depth at that position from the TIN model. **T**he section file can be either two or three-dimensional and multi-segmented, but may not be curved..

This was developed for a user who needed soundings along a pipeline.

FIGURE 7-8. *Sample Line Export*



TIN-TO-CHANNEL COMPARISONS

If you have included a Channel file in your TIN model, you can:

- **Calculate the Average of the TIN and Channel depths,**.
- **Calculate the Difference between the TIN and Channel depths,** which tells you the heights of the survey data above or below your design template.

The data points are horizontally located in the same way as single- surface XYZ export points.

NOTE: If you have two TIN surfaces, designate which TIN surface to use in the calculations by checking the TIN1 or TIN2 check box.

TIN-TO-TIN COMPARISONS

Where you have two TIN surfaces—the Input file and the Additional file-- you can perform all of the exports we have discussed to this point. If you choose one of these calculations that require only one TIN surface, designate which TIN should be the basis of the calculation by checking the TIN1 or TIN2 check box.

In addition, you can:

- **Calculate depth differences**: The Differences option creates an XYZ file where the Z value represents the difference between the two TIN Models.
- **Average the depths between them**.

TIN-to-TIN comparisons are made at:

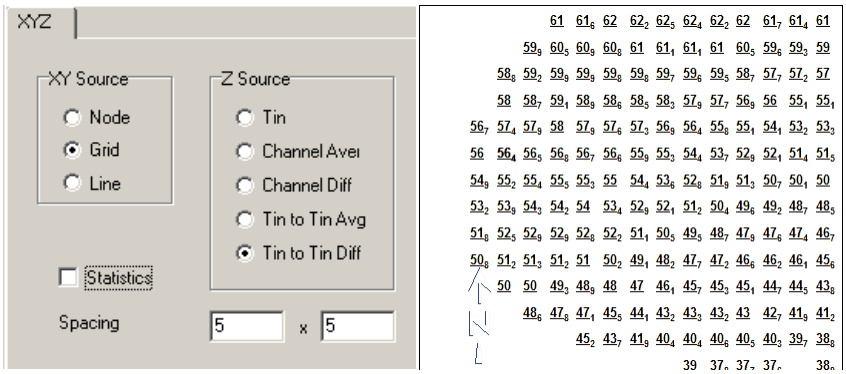
- **At each node of a grid** with cells of user-defined size.
- **At each node** of TIN 1 and the corresponding XY position of TIN 2 and at each node of TIN 2 and the corresponding XY position of TIN 1.

The following examples show a sample dialog for each combination of choices with the results of each choice..

- **Grid Differences:** TIN MOPDEL creates a grid large enough to include both TIN models and with cells of a user-specified size. It then calculates a value at each node in the grid. This value represents the difference between the depth of TIN1 and the depth of TIN2 at that point

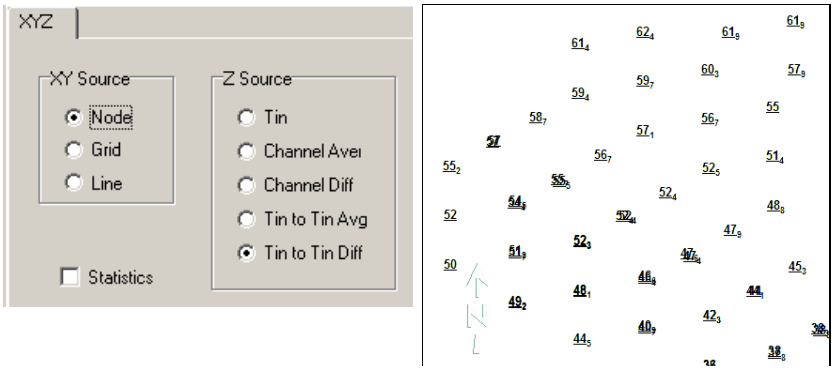
  The file of differences at the TIN model nodes can be particularly useful in studies of erosion and sedimentation. In this context, you could use your exported file to build a new TIN model. The contours of this model will show the areas where material has accumulated or eroded over the time between the surveys. A TIN-to-Level volumes calculation, with a level of zero, will calculate the volume of material accumulated (Volume Above) and depleted (Volume Below). The difference of these values represents the total change in the amount of material in your channel.

FIGURE 7-9. *Differences in a 5x5 Grid*



- **Node Differences:**TIN MODEL will calculate a value at each node in each TIN model. This value represents the difference between the depth of TIN1 and the depth of TIN2 at that point.

FIGURE 7-10. *Sample Node Differences*



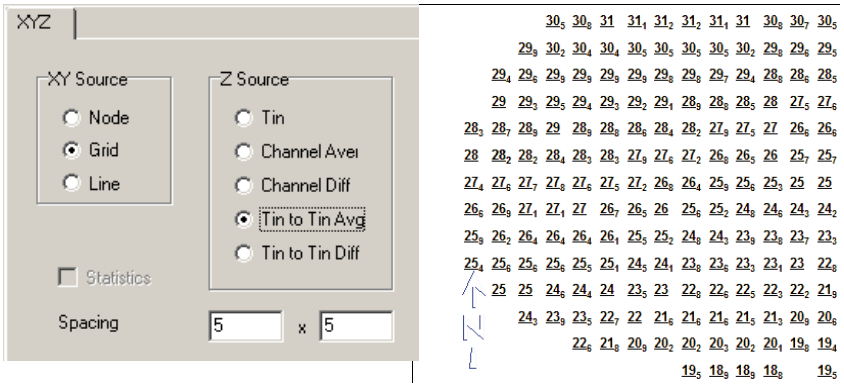
The **Statistics** checkbox is enabled when you export TIN-to-TIN differences. This option appends a distribution graph of the significance of their difference.

FIGURE 7-11. *Sample TIN Differences Statistics Report*

```
-10s:
 -9s:
 -8s:
 -7s:
 -6s:1
 -5s:36
 -4s:***750
 -3s:******1398
 -2s:****1103
 -1s:**********************5102
 +1s:*********************************************...**************17895
 +2s:*****1332
 +3s:10
 +4s:1
 +5s:
 +6s:
 +7s:
 +8s:
 +9s:
+10s:
```

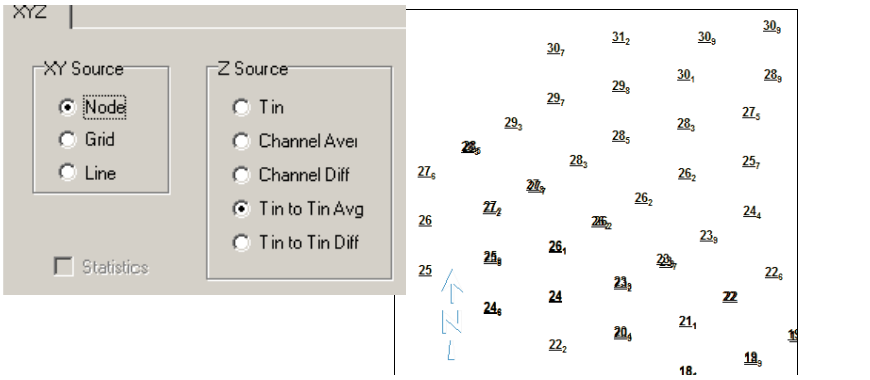
- **Grid Averages:**TIN MODEL creates a grid large enough to include both TIN models and with cells of a user-specified size. It then calculates a value at each node in the grid. This value represents the average of the depth of TIN1 and the depth of TIN2 at that point.

FIGURE 7-12. *Sample Grid Averages in a 5x5 Grid*



- **Node Averages:** TIN MODEL will calculate a value at each node in each TIN model. This value represents the average of the depth of TIN1 and the depth of TIN2 at that point.

FIGURE 7-13. *Sample Node Averages*



EXPORTING CONTOURS FROM TIN MODELS

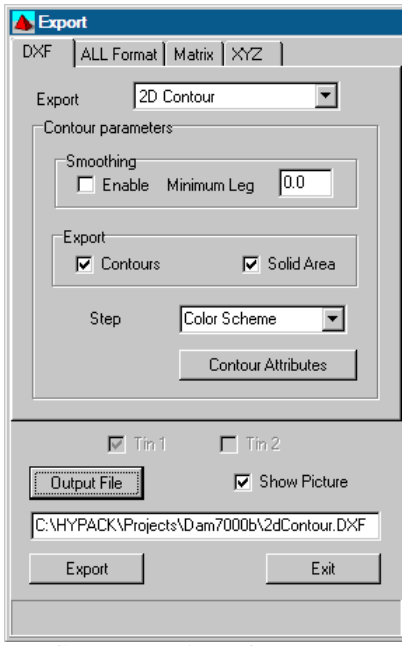
The DXF Format routine enables you to export contours of your data. The primary one is 2D Contours. These files can be used in HYPLOT or imported to other programs such as AutoCAD.

For the best results in exporting contours, we recommend the following:

- Use Sorted data to construct the TIN Model.
- Use the "Smooth" option.
- Specify a Minimum Leg appropriate to your line spacing.

1. **Select EXPORT-DXF**.

FIGURE 7-14. DXF Format Window



2. **Set the options for the export file**.
   - **Output File** names the exported DXF data. Most packages require DXF files to have a *.DXF extension.
   - **Export:** The TIN MODEL program can export the following items to DXF format:
     - 2D Contour
     - 3D Contour
     - 3D TIN

     NOTE: 3D files only appear in three dimensions when you load them to a CAD program. In HYPACK®, they are viewed from above and appear only 2-dimensional.

     All DXF output information is written in real world coordinates.
   - **Smoothing** evens the jagged edges in the contours by outputting a B-Spline anywhere the TIN leg is longer than the Minimum Leg specified. It creates a DXF file about eight times the size of the non-smoothed contours. They can be plotted from HYPLOT or from other CAD packages it.
   - The **Minimum Leg** limits the amount of smoothing by reducing the number of vertices in the B-spline so that no two points are closer than the specified distance. Smoothing will not occur where the TIN Model leg is shorter than specified here. A larger the 'Minimum Leg results in more jagged contours and a smaller file size.

     Beware!

     BEWARE! If the Minimum Leg is too large, you can actually move a contour on the wrong side of a sounding. You may need

to experiment a little to find a compromise 'Minimum Leg' distance that will provide you with pleasing contours that are on the correct side of the soundings.

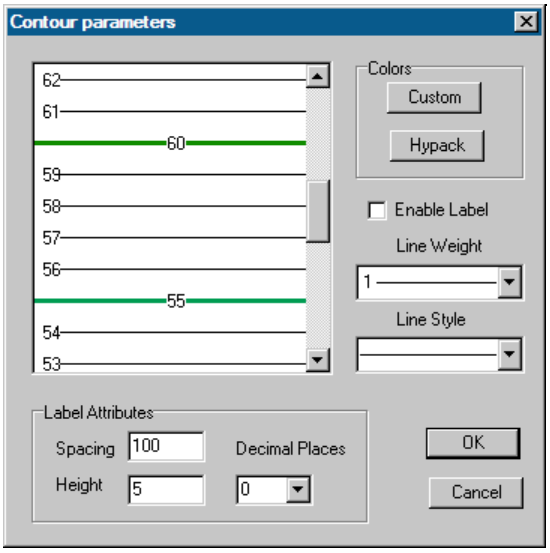
Start with a value equal to about 15% of the spacing between planned lines.

- **Contours** creates contour lines and, if specified in the contour attributes, labels for them.
- **Solid Area** creates color-filled contours.
- If both "Contours" and "Solid Area" are selected, TIN MODEL overlays contour lines on color-filled contours.
- **Step** enables you to specify a regular contour interval, used in the creation of 2D and 3D Contours. You can select a value from the drop-down menu or type in a value of your own.
  - **Custom** enables you to create an irregular step. Check the "Custom" option then enter your desired contour levels in the Custom Levels field. Leave a single space between each contour level. For example, "2 5 25 100".
  - **Color Scheme** creates a contour line at each level specified in the project colors.
  - Select **File**. A File button will appear for you to browse for a text file with a space-delimited listing of the levels you require.

NOTE: Specify only levels that occur within the range of your sounding data. Levels outside the data range will disable the Contour Attributes dialog.

- Once you have the contour parameters set, click **[Contour Attributes].** The Line and Label Attributes dialog will appear.

FIGURE 7-15. *Line and Label Attributes Dialog*



The left side of this dialog is populated based on the minimum and maximum of the depths in your sounding file. It shows how each contour line will appear in the exported file. You can select one or more lines, then make selections at the right to set their attributes.

To select several individual contour lines, hold the Ctrl key while you use your mouse to choose your lines

To select a range of contour lines, hold the Shift key and select the first and last line of a range.

Enable Label places labels on the selected contour according to the Label Attributes where:

- **Label Spacing** defines the distance, in survey units, between the labels on each contour.
- **Label Height** sets how big the label will be.
- **Decimal Places** sets the resolution of the labels. If the soundings in the Input file has accuracy to 4 decimals or more, TIN MODEL can create contours to 0.0001 unit accuracy. In most cases, two decimal accuracy (0.01 units) will be sufficient.

NOTE: If you intend to use these files in the ENC EDITOR program, use the highest possible accuracy. Rounding or truncation of position information may result in creating multiple points at the same position instead of side-by-side. ENC EDITOR conforms to the very strict S57 chart drawing rules and such duplication is not allowed.

- The **Color** can be defined using [Custom] or [HYPACK].
  - **[Custom]** displays a color dialog from which you can choose the color of the selected line or lines.
  - **[HYPACK]** uses the project color settings to color-code the selected contour line or lines.
- **Line Weight** offers a choice of increasing thicknesses for you to accentuate certain contours.
- **Line Type** provides five options, solid line and four combinations of dots and dashes for further distinction from other lines.

NOTE: Windows® can not handle both line type and weight. Therefore, in any Windows® application, including HYPACK®, contours that have been given both a dotted line type and a weight thicker than 1 pixel, will appear solid. They will, however, be drawn with both type and weight characteristics if you import them into a CAD package.

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3. **Click [OK]** to return to the DXF Export dialog.
4. **Click [Export]** to begin the export process. TIN MODEL will create the DXF file to your specifications.

EXPORTING TIN MODEL IMAGES

The tool bar of each 2D or 3D model window includes icons that enable you to export your model in a graphics file format. You can export:

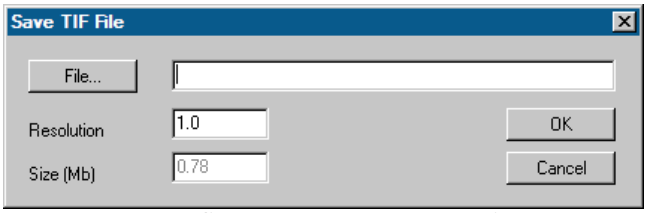
- **A Geo-referenced *.TIF file** which can then be used as a background file in HYPACK®, SURVEY, DREDGEPACK® or HYPLOT.
- Screen captures as **BMP or TIF** graphics files.
- **Printed screen captures**

EXPORTING GEO-REFERENCED TIF FILES FROM TIN MODEL

You can export geo-TIF images from either 2D or 3D models. To generate a geo-TIF from a 3D model, all rotation angles must be set to zero. If the Geo-TIF icon is disabled, go to the Setup dialog and reset them to zero.

1. **Click the Geo-TIF Icon on a 2D or 3D model tool bar**. The Geo-TIF Settings dialog will appear.

FIGURE 7-16. *Geo-TIF Settings Dialog*



2. **Name your file and set your resolution**.
   - **[File…]** presents a File Save dialog for you to name your file (including the path where it will be stored). The default path will be to your project folder
   - **Resolution** adjusts the level of detail in the resulting file. A smaller resolution creates a larger, more detailed file. Your task is to choose a resolution low enough to provide the detail you require without creating an overly large file. The size of the resulting TIF will automatically update according to the given resolution.
3. **Click [OK]**. TIN MODEL will create a geo-referenced TIF file from the contents of the TIN viewing screen You can then load it to HYPACK® as a background file.

EXPORTING YOUR TIN MODEL AS A BMP OR TIF IMAGE.

To save a screen capture of a model, regardless of its rotation, to a BMP or TIF format file by clicking the Snap Shot icon in the model's tool bar. A dialog will appear for you to name your image. These are for visual reference only. *They can not be used as background files in HYPACK®.*

PRINTING A SCREEN CAPTURE OF YOUR TIN MODEL

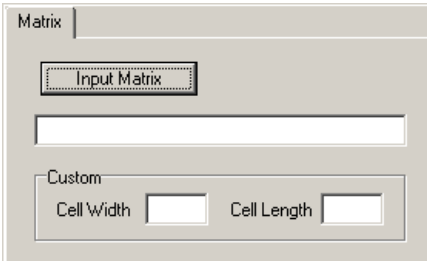
To print a screen capture, just click the Print Screen Icon. A screen capture is sent directly to your default printer.

EXPORTING MATRIX FILES FROM TIN MODELS

The TIN MODEL program can take an existing Matrix file or create a new one, and fill the cells with the data from your TIN Model. The soundings from a single-surface TIN model will be saved as survey depths in the matrix. If you include an Additional File in your TIN Input, the depths from the second surface will be saved as dredge depths.

1. **Select EXPORT-MATRIX**.

FIGURE 7-17. *The Matrix Export Dialog*



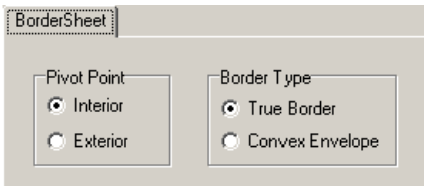
2. **Set your Matrix information**.
   - **If you want to match to an existing Matrix,** click [Information] and select an existing Matrix. The program will create a matrix with the same position, size, rotation and cell dimensions as the selected matrix and save the TIN Model data to the same or a different matrix.
   - **If you are creating a new Matrix,** enter the cell dimensions. The program will calculate the matrix size and rotation to fit the data.
3. **Click [Output] and name your output file**. You can use the same name as the original Matrix file or specify a new name.
4. **Click [Export]** and the file will be exported.

EXPORTING BORDER FILES (*.BRD) FROM TIN MODELS

Generating border files representing the perimeter of your TIN Model is a simple task in TIN MODEL. The border can include all the curves of your survey data—a **True Border--** or be a simple convex shape; you can designate the side of the border on which that all-important In/Out point will reside. (The In/Out point determines which data is saved and which is discarded when the border is used in other programs.)

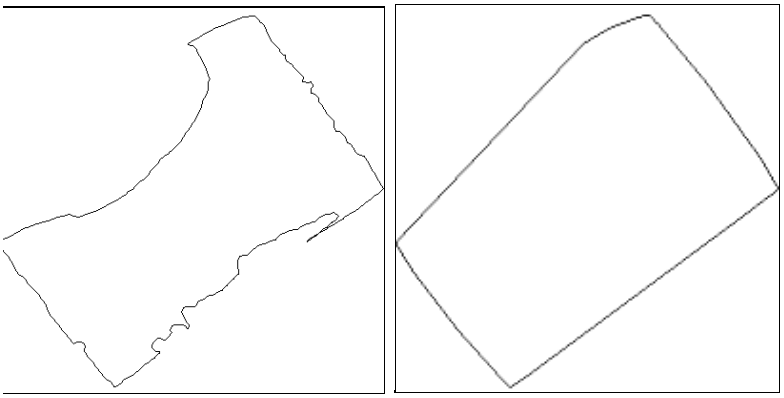
1. **Select EXPORT-BORDER**.

FIGURE 7-18. *Border Export Dialog*



2. **Set the location of the In/Out Point** (Pivot Point)**.**
3. **Choose your border type**.

FIGURE 7-19. *True Border (left), Convex Envelope (right)*



4. **Click [Output File] and name your border file**.
5. **Click [Export].** The border file will be saved, by default, to your project directory.

SIMPLE CHANNEL FILES (*.CHN) FROM TIN MODELS

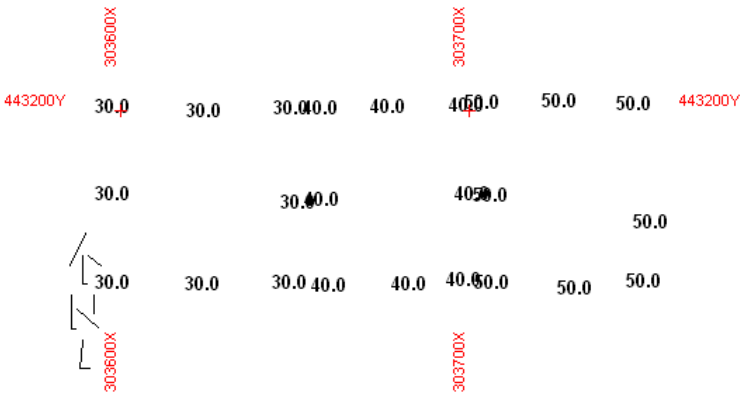
Very simple data sets can be converted into Channel Template (*.CHN) files using the TIN MODEL program. This can be a useful tool for converting small XYZ files to CHN files. It is faster and easier than manually entering each coordinate into ADVANCED CHANNEL DESIGN.

NOTE: SURVEY limits CHN files to 250 nodes so this is only useful if your TIN model is very simple.

This application of TIN MODEL has been frequently used in beach reclamation projects where the project specifications designate areas that may be dug to different depths. Using the XYZ COLLECTOR, we can quickly create an XYZ file describing the borders and depths of each area, then use it in TIN MODEL to create the channel file.

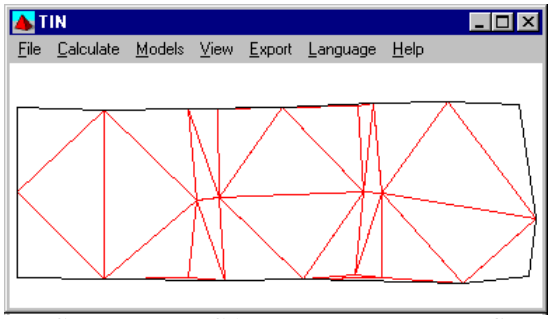
1. **Define each depth area** using the XYZ COLLECTOR. In this example, we are creating a stair-step template with depths at 30, 40 and 50 feet.

FIGURE 7-20. *Three areas defined by an XYZ file.*



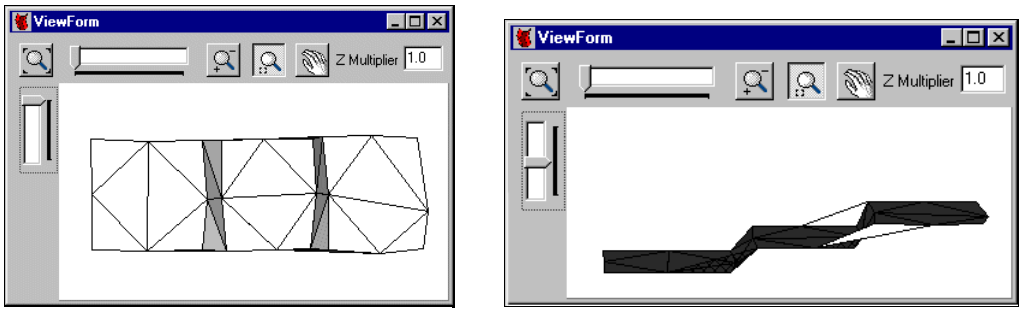
2. **Use the XYZ file to create a TIN Model**.

FIGURE 7-21. *TIN Model from the XYZ file.*



3. **Select FILE-SAVE and change the file type to CHN** in the File Save dialog. TIN Model will save the channel file to your project directory.

FIGURE 7-22. *Resultant CHN file displayed in ADVANCED CHANNEL DESIGN*



EXPORTING BAG FILES

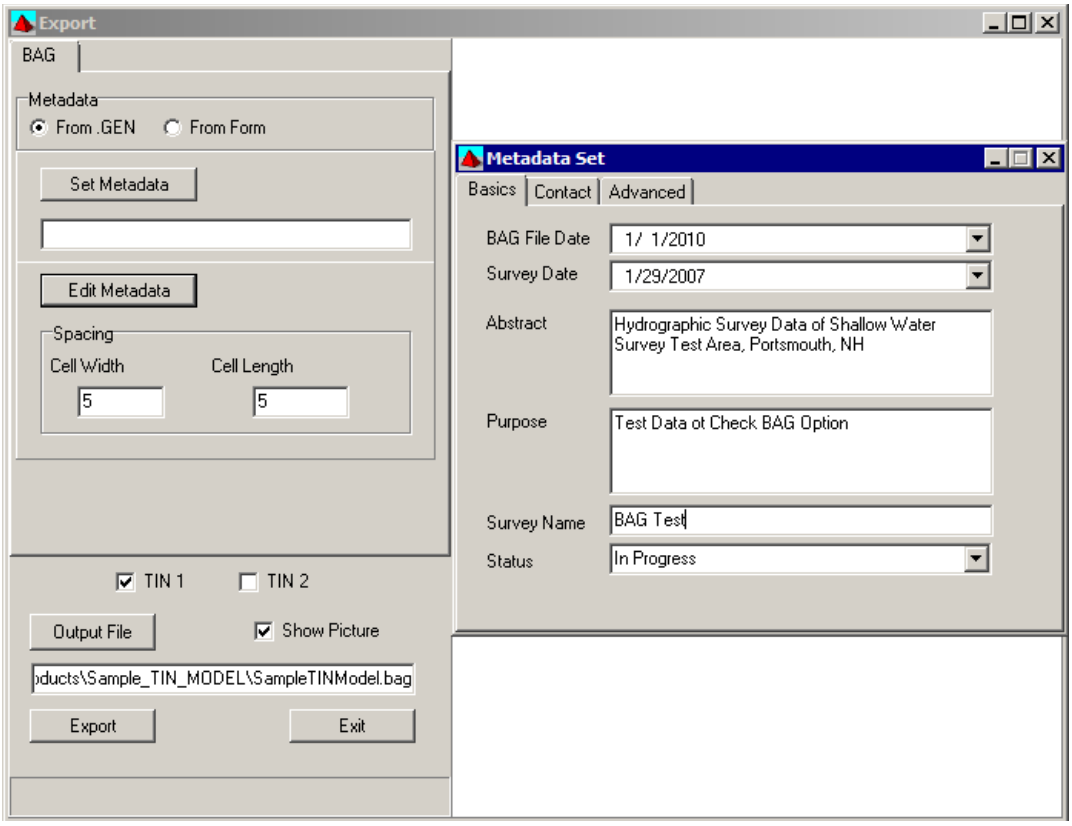
The Bathymetric Attribute Grid (BAG) file type is the standard for the National Ocean Service (NOS) hydrographic data files. They contain XML metadata and two Layers in a matrix format one of Elevation and another Uncertainty. Also contained is a list of post file creation edits to the data.

NOTE: In TIN MODEL, we do not calculate uncertainty values; we assign '0' for all uncertainty values.

To create a BAG file in TIN MODEL:

1. **Open TIN MODEL and build the model of your data**.
2. **Select EXPORT-BAG** to open the Export window.
3. **Enter the metadata.**
   a. In the Bag tab, choose to set the metadata yourself, or import the information from a pre-existing metadata (*.GEN) file.
   b. If you are loading data from the GEN file, click [Set Metadata] to browse for the required file.
4. **Edit the metadata if required**.

FIGURE 7-23. *Generating BAG Files from TIN MODEL*



5. **Enter the matrix spacing**
6. **Click [Output File]** and provide a name for the BAG file.
7. **Click [Export]**. The program will generate the BAG file that includes your metadata and the TIN data as the elevation layer.

TIN MODEL REPORTS

The View Report and Print Report options in the Export Menu are used to view and print the TIN Model report.

Some reports are too wide even if you set the page to landscape view. If this happens, save the report to a text file and reopen it in a word processing program where you can adjust the print font. Try using:

- Landscape paper orientation
- Left and Right Margins at 0.25 inches
- Font at 8 points

VOLUMES BASED ON SURFACE CALCULATIONS

The TIN MODEL Program is capable of calculating the volumes between two different surfaces. These calculations can be based on the following methods:

- Survey Surface vs. Level
- Survey Surface vs. Channel
- Survey Surface vs.2nd Survey Surface
- Survey Surfaces vs Design Surface
- Philadelphia Method

The TIN MODEL can read data files in, either ASCII XYZ format, the HYPACK® edited ALL format or a matrix file. You can specify a Catalog file (*.LOG) that contains a list of data files. TIN MODEL creates a surface by connecting adjacent data points in optimized triangles. The program then computes volumes by comparing the difference in elevation of each triangle node as it is projected onto the comparison surface. Surface-based volumes calculations are the most accurate where you are using multibeam or multiple transducer survey data and non-parallel survey lines.

NOTE The thinner the data used to create the TIN Models, the less time it will take to compute the volumes calculations and the less accurate they will be. Of course, while choosing not to thin your data at all might improve your accuracy, it could mean that it will take a long time to create the TIN Models and calculate the volumes. It's up to you to balance the two factors to your satisfaction when you choose the grid size in the matrix used in MAPPER or the HYSWEEP® EDITOR.

As a starting point, we suggest that for soft bottoms, which tend to be smooth, try a 10 or 20 foot grid. For hard bottoms, which are more likely to have sharp contours, try a 5 foot grid.

To calculate a Volume in the TIN MODEL program:

Beware!

1. **Create the surface model**. If you plan to use the Philadelphia calculation method, include a 3-dimensional, single-segmented Planned Line file for your survey area.

   BEWARE! In HYPACK®, some users inverted their data for TIN-to-TIN volumes calculations. This option should no longer be necessary, nor is it available. If depths in your exported files need to be inverted, this conversion can be made in the EXPORT program.
2. **Select CALCULATE-VOLUME** and select the appropriate settings in the Volume Calculations Control dialog. When you click [OK], the volume calculation will begin.
3. **Save the results** by selecting EXPORT-VIEW REPORT. Your Volumes Report will be opened in NotePad where you can save it to a

text file. Examples with detailed instructions may be found in your manual.

Advantages to Calculating Volumes in the TIN MODEL program:

- It is generally very fast.
- It is the most accurate computation available particularly where the surface is uniform and survey lines are non-parallel or unequal in length, or both.
- It calculates both cut and fill.
- It graphically shows you where the material is that must be removed.
- Volume quantities can be computed with multibeam and multiple transducer data.
- Accounts for variations in bottom topography between planned lines.
- You can quickly calculate the change in volume over different channel templates just by changing your Section file and recalculating the volume with the same data set.

Disadvantages to calculating Volumes in the TIN MODEL program:

- It does not calculate separate numbers for subgrade or supergrade surfaces.
- Where survey lines are not perpendicular to the side slope, your volumes may be overstated, particularly where material is concentrated at the inside or outside of the turn. In this case, we recommend the Standard HYPACK® method and align the TIN to the planned line.

VOLUMES CALCULATION CONTROL

CALCULATE-VOLUME displays the Volume Calculation Control dialog where you can set options for your volume computation. When the calculation mode is set, the relevant options in the lower part of the dialog will be enabled and disabled accordingly.

NOTE If a design file is included in your TIN Model, the TIN-to-TIN option will be modified to TIN-to-Design.

TIN-TO-LEVEL CALCULATIONS

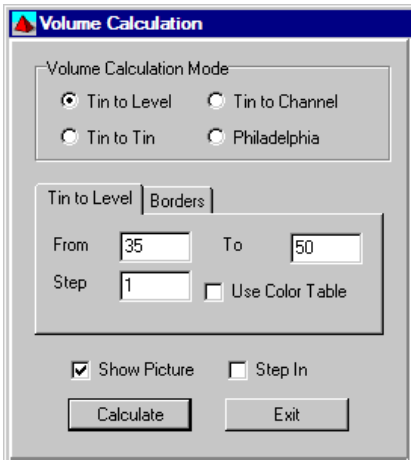
TIN-to-Level calculates the volume of material above one or more user-specified levels and the volume of material required to bring any low areas up to the same levels. It also calculates the area of the model that lies above and below the specified levels.

- The **Volume Above** shows the number of cubic meters (or cubic yards) which must be removed to get the channel to the specified level.
- The **Volume Below** is the amount of material that would have to be added to bring the surface up to the design surface or level.

- The TIN-to Level computation also gives you the **Area Above** and **Area Below**, which are the corresponding surface areas.

TIN-to-Level Settings enable you to set a depth or range of depths to be used in TIN-to-Level volumes calculations.

FIGURE 7-1. *Sample TIN-to-Level Settings*



To calculate volumes to a range of levels,

- **Enter a range of levels** and the level increment. For example, you can calculate the volumes between your data set and 5, 10, 15 and 20 foot (or meter) levels by entering From = 5, To = 20, Step = 5.
- Check "**Use Color Table**" for volumes calculations at each level defined in your project colors file.
- Check the "**Step In**" options to calculate one level at a time.

You control when the next level is calculated with a [Next] button that appears while the calculation process occurs.

To calculate volumes at one level, enter the same level in both the From and To fields and set Step=1.

FIGURE 7-2. *Sample TIN-to-Level Volumes Report*

Volume unit: Cubic Yard

Level	Volume Above	Area Above	Volume Below	Area Below
35.00	20284.87	361433.80	221123.90	1751709.85
40.00	193356.04	1893825.95	2872.18	219317.70
45.00	581806.76	2113143.65	0.00	0.00
50.00	973129.66	2113143.65	0.00	0.00

TIN-to-Level calculations can be limited to user-defined areas by adding one or more borders in the Borders tab. (See 'Restricting Volumes Calculations with Border Files".)

TIN-to-Channel Calculations

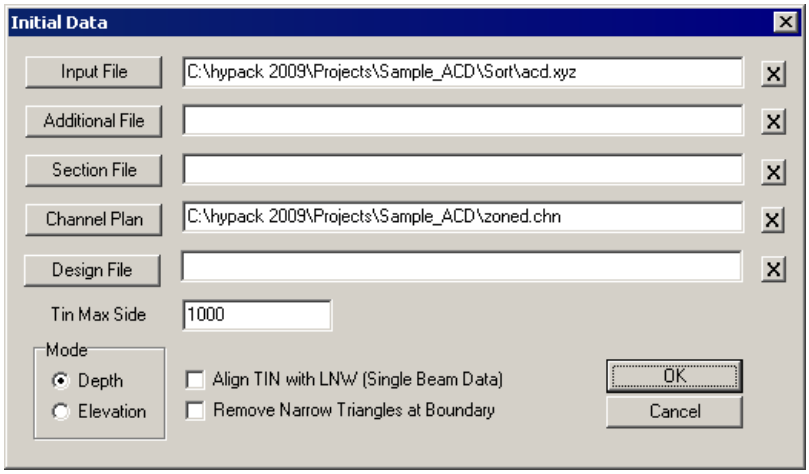
The TIN-to-Channel calculation method computes the volume above and below your channel template (*.CHN). We have multiple variations.

- **Standard TIN-to-Channel** computes four values (Volume Above, Volume Below, Area Above, Area Below) for each face of the channel file (*.CHN) specified in the Initial Data dialog, as well as their totals for the entire channel.
- **TIN-to-Channel Zones**: If you have defined zones when you created the channel file in ADVANCED CHANNEL DESIGN, the TIN MODEL program can compute volumes for each zone, instead of each face. Areas are not calculated.
- **Border-limited TIN-to-Channel:** Calculations can be limited to user-defined areas by adding one or more borders in the Borders tab.

Standard TIN-to-Channel Volumes

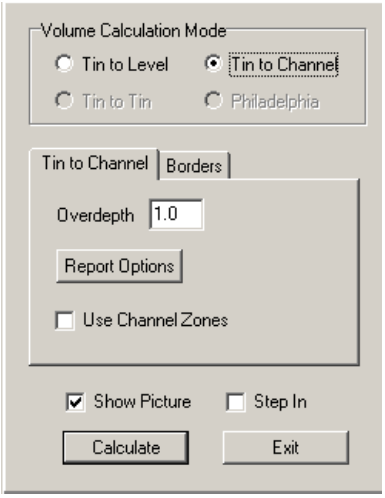
For a straight comparison between your survey surface and the channel file, TIN MODEL requires only the channel file with the data file in the initial setup dialog.

FIGURE 7-3. *Building the TIN Model for standard TIN-to-Channel Volumes*



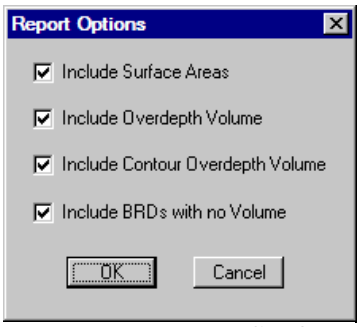
In the Volume Calculations Dialog:

FIGURE 7-4. *Sample TIN-to-Channel Settings*



1. **Select 'TIN to Channel'**.
2. **Clear the 'Use Channel Zones' option**.
3. **Set your report options**.
   a. Click [Report Options].
   b. Select the values you want to include in your report and click [OK].

FIGURE 7-5. *Report Options dialog*



- **Include Surface Areas:** Reports volume above the design template.
- **Include Overdepth Volume:** Reports all, Non-Contour overdepth volumes.
- **Include Contour Overdepth Volume:** Reports overdepth material only in areas only where the depth is shoaler than the design template.
- **Include BRDs with no Volume:** By default, the program will omit any bordered areas where the bottom is less than the overdepth. If you would prefer to report all areas, check this option.

4. **Click [Calculate]**.

FIGURE 7-6. *Sample TIN to CHN Report without Border Files*

Volume unit: Cubic Yard

Face	Volume Above Channel	Volume Below Channel	Area Above Channel	Area Below Channel
1	11820.69	69755.99	45402.04	109552.15
2	5794.21	36162.53	22691.43	56766.53
3	621.56	3614.71	2654.10	6234.85
4	1638.08	270.50	7155.99	2212.72
5	626.64	3763.76	2701.01	6449.17
6	1713.96	11484.46	6758.03	17538.97
7	66016.26	0.00	115996.71	0.00
8	4212.97	0.00	9368.55	0.00
9	7402.68	0.00	13847.42	0.00
10	7408.97	0.00	14136.23	0.00
11	609221.17	0.00	1468635.50	0.00
Total	716477.19	125051.95	1709347.00	198754.39

FIGURE 7-7. *Sample TIN-to-Channel Volumes Reports with Borders*

Volume unit: Cubic Yard
Overdredge: 1

Border File	Volume Above Design	Volume in Overdredge	Contour Volume
DE5D	5385.00	2188.93	2188.93
DE8D	4044.70	1438.93	1438.93
DE57	6255.21	2325.06	2325.06
DEC1	11010.50	3786.57	3786.57
DEC3	8021.89	3199.69	3199.69
DEC5	5216.30	2323.83	2242.36
DEC7	1.31	0.45	0.45
DEC9	13.00	4.27	4.27
DED3	1222.67	368.21	368.21
DED5	4315.31	1364.72	1364.72
DED7	1142.29	385.82	359.27
Total	46628.18	17386.50	17278.48

Beware!

BEWARE! Use caution when computing volumes where the survey lines are not perpendicular to your side slope. Because of the way TIN Models are created, your volumes may be overstated. We are working on ways to improve on this, but nothing will be perfect.

Beware!

BEWARE! With so many different options that can affect your outcome It requires some careful checking to ensure you are classifying the material as either accumulated or depleted. Such options include:

- XYZ Files are in Depth
- XYZ Files are in Elevation
- Initial File survey came before Additional File survey
- Additional File survey came before Initial File survey.

TIN-to-Channel Volumes with Multiple Channel Files

If you have multiple nested channel files (*.CHN), TIN MODEL can use the Philadelphia method to calculate the volume between each one.

The channels in the following figure show the situation for which this process was developed. They had previously dredged to the depths of the upper two channels, but needed to expand the channel design to that described by the deeper two channel profiles. Thus the channels represent the design depth and overdredge depth of the original channel and the new, larger channel.

FIGURE 7-8. *Sample Nested Channel Profiles*

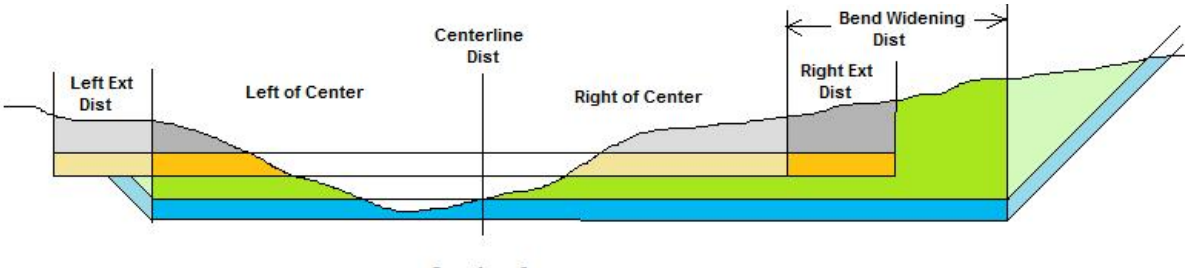
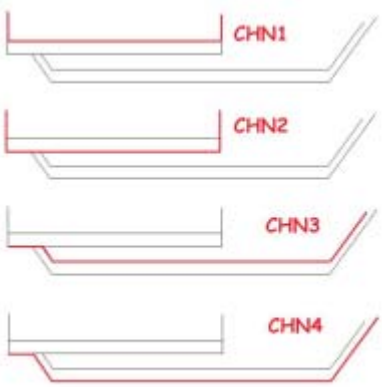


FIGURE 7-9. *Sample Channel Files*

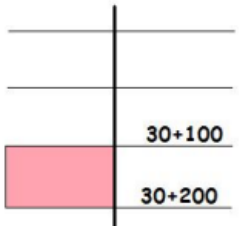


Maintenance Dredging:
CHN1: Above Design
CHN2: Overdredge

New Dredging Area:
CHN3: Above Design
CHN4: Overdredge

It reports the based on the areas defined by a center line file and a section file. For each section, the volumes are reported for the areas left and right of center.

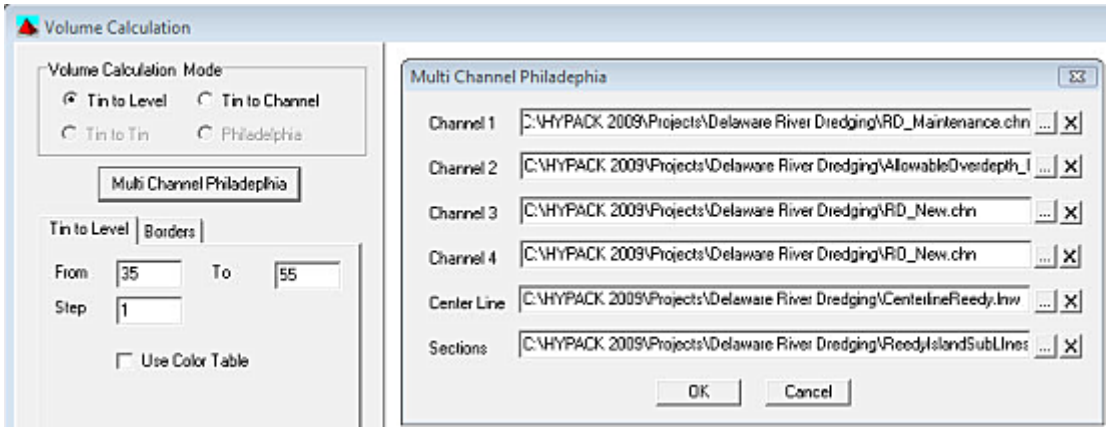
FIGURE 7-10. *Volumes are calculated left and right of center for each section*



To calculate volumes in this manner requires a specialized setup listing your channel files and the line files.

1. **Build your TIN model**.
2. **Select VOLUMES-CALCULATE** to access the Volumes Calculation dialog.
3. **Click [MultiChannel Philadelphia].** The Multi Channel dialog will appear.

FIGURE 7-11. *Sample Multi Channel Philadelphia Dialog*

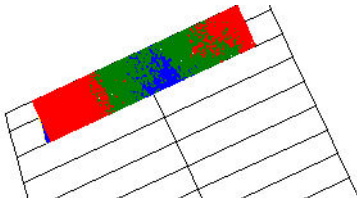


4. **Enter your channel files (*.CHN) and your center line and section files (*.LNW) and click [OK]**.

As the program calculates the volumes, it draws each section to the screen:

- Material above CHN4 is yellow.
- Material above CHN3 is blue.
- Material above CHN2 is green.
- Material above CHN1 is red.

FIGURE 7-12. *Sample Volumes in Process*

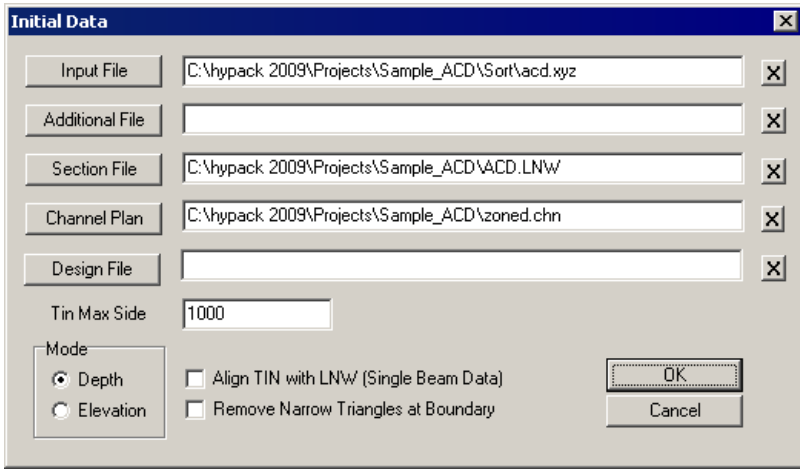


The resulting volumes report shows the volumes for each section and the accumulated volumes as each section is completed.

TIN-TO-CHANNEL VOLUMES WITH A ZONED CHANNEL

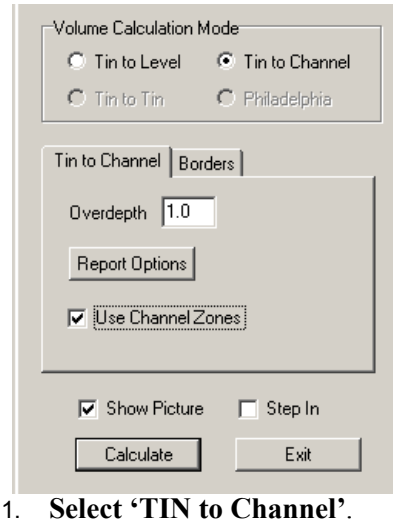
If you are calculating your volumes with a zoned channel file, your initial data must include your survey data, as well as both your zoned channel file and your survey line file.

FIGURE 7-13. *Initial Data for Zoned TIN to Channel Calculations*



In the Volume Calculations Dialog:

FIGURE 7-14. *Sample TIN-to-Channel Settings*



1. **Select 'TIN to Channel'**.
2. **Select the 'Use Channel Zones' option**.
3. **Set your report options**.
   a. Click [Report Options].
   b. Select the values you want to include in your report and click [OK].
4. **Click [Calculate]**.

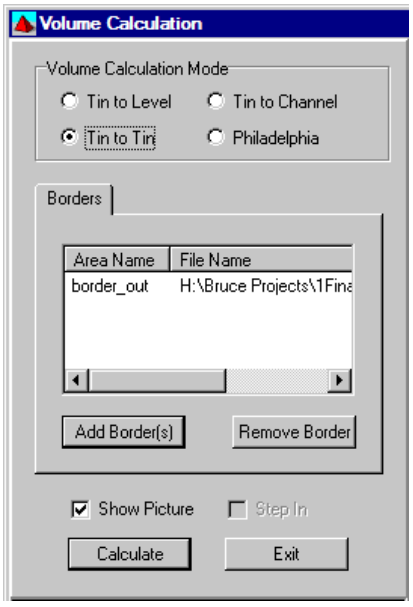
FIGURE 7-15. *Sample Zoned Report*

```
-------------------------------------------------------------
Federal Channel          250.43                772.34
Navy Admin               0.00                  0.00
Civil Works              36.82                 56.71
Side Slope               201.71                350.81
-------------------------------------------------------------
Total:                   488.96                1179.86

Line 167+00 to 168+00
Zone              Volume Above Design  Volume in Overdredge
-------------------------------------------------------------
Federal Channel          57.91                 454.81
Navy Admin               0.00                  0.00
Civil Works              0.00                  0.00
Side Slope               7.80                  38.77
-------------------------------------------------------------
Total:                   65.71                 493.59

All Lines         Volume Above Design  Volume in Overdredge
-------------------------------------------------------------
Federal Channel          16554.46              131604.41
Navy Admin               309.12                6396.41
Civil Works              9306.05               13697.00
Side Slope               8335.16               12132.18
-------------------------------------------------------------
Total:                   34504.79              163830.00
```

TIN-TO-TIN CALCULATIONS

TIN-to-TIN represents the volumes of TIN1 above and below TIN2.

FIGURE 7-16. *Sample TIN-to-TIN Calculation Settings*



Notes: It is important to note that it will make a difference which set of data is used for TIN1 vs TIN2. TIN1 is used as a pattern to match to TIN2. Since no two surveys will be exactly alike, data from TIN2 will be discarded where TIN2 goes outside the bounds of TIN1.

Using dense data sets will give you more accurate results because

TIN MODEL can make a more accurate match to the TIN1 pattern. You may want to run a few tests of your own to compare how varying grid sizes during sounding selection affects the volumes results when you use the data in these volumes calculations.

TIN-to-TIN calculations can be limited to user-defined areas by adding one or more borders in the Borders tab.

FIGURE 7-17. *Sample TIN-to-TIN Volume Report*

```
TIN vs TIN Volume Totals
Volume unit: Cubic Yard
Volume Tin1 Above Tin2 = 115828.88
Area Tin1 Above Tin2 = 1577211.37
Volume Tin1 Below Tin2 = 13575.94
Area Tin1 Below Tin2 = 519645.05
```

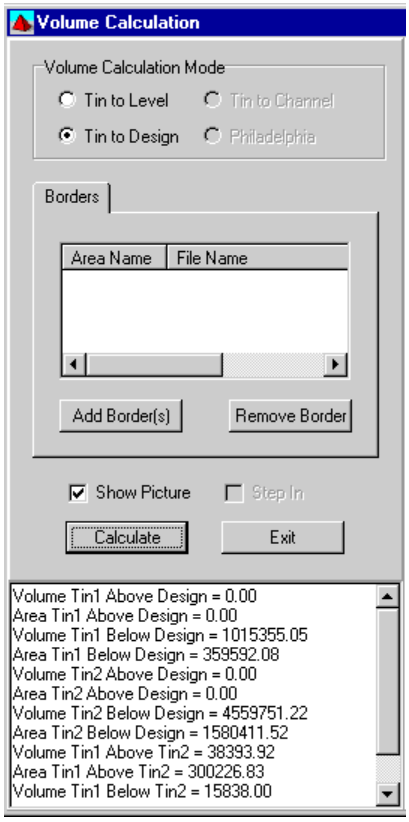
More Information

- “Restricting Volumes Calculations with Border Files” on page 7-169

TIN-TO-DESIGN CALCULATIONS

TIN-to-Design represents the volume between the Design Surface and the survey surfaces. If you have loaded both an input file and an additional file, the program will also calculate the volume between TIN1 and TIN2.

FIGURE 7-18. *Sample TIN-to-Design Settings*



NOTE: When you load a Design Surface, the TIN-to-TIN option changes to TIN-to-Design.

TIN-to-Design calculations can be limited to user-defined areas by adding one or more borders in the Borders tab.

FIGURE 7-19. *Sample TIN-to-Design Volumes Calculations Report*

```
Tin File: F:\UnsortedProjects\Sample_HYSWEEP_Survey\Sort\sample.xyz
Additional File: F:\UnsortedProjects\Sample_HYSWEEP_Survey\bisso.mtx
Design File: F:\UnsortedProjects\Sample_HYSWEEP_Survey\20.mtx
Vertical Orientation: Depth Mode
Tin Alignment: off

Maximum Leg: 100.00
X Maximum: 3660194.37
X Minimum: 3659744.99
Y Maximum: 521104.07
Y Minimum: 519509.07
Z Maximum: 150.79
Z Minimum: 32.32
Number of Points: 305805
Number of Triangles: 611100


Volume unit: Cubic Yard
TIN vs Design Volume Totals
TIN1 File: F:\UnsortedProjects\Sample_HYSWEEP_Survey\Sort\sample.xyz
TIN2 File: F:\UnsortedProjects\Sample_HYSWEEP_Survey\bisso.mtx
Design File: F:\UnsortedProjects\Sample_HYSWEEP_Survey\20.mtx

Volume Tin1 Above Design = 0.00
Area Tin1 Above Design = 0.00
Volume Tin1 Below Design = 1015355.05
Area Tin1 Below Design = 359592.08

Volume Tin2 Above Design = 0.00
Area Tin2 Above Design = 0.00
Volume Tin2 Below Design = 4559751.22
Area Tin2 Below Design = 1580411.52

Volume Tin1 Above Tin2 = 38393.92
Area Tin1 Above Tin2 = 300226.83
Volume Tin1 Below Tin2 = 15838.00
Area Tin1 Below Tin2 = 186962.87
```

More Information

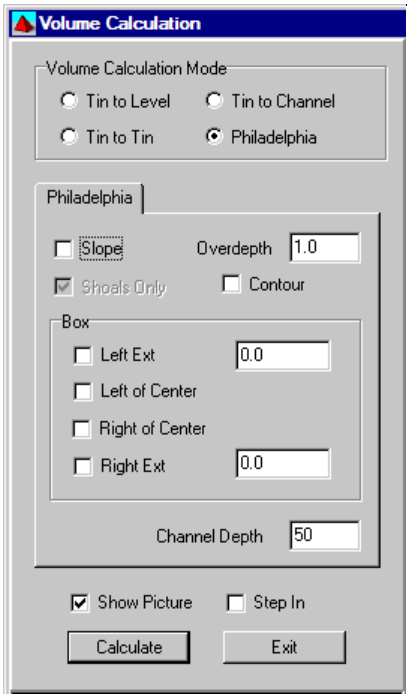
- “Restricting Volumes Calculations with Border Files” on page 7-169

PHILADELPHIA CALCULATIONS

Philadelphia calculates pre-dredge and post-dredge volumes. These methods are unique in how they handle calculating volumes of the overdredge material. They also provide choices:

- to use the channel template or to create a box template.
- to calculate or omit the overdredge in the side slope/box extension by setting it to zero.
- to calculate volumes for any combination of template segments.
- to modify the channel depth.

FIGURE 7-20. *Sample Philadelphia Volumes Settings*



The **Slope** option calculates volumes on the side slopes. Clear this option to replace the slopes with a box template. Box Templates are described later in this section.

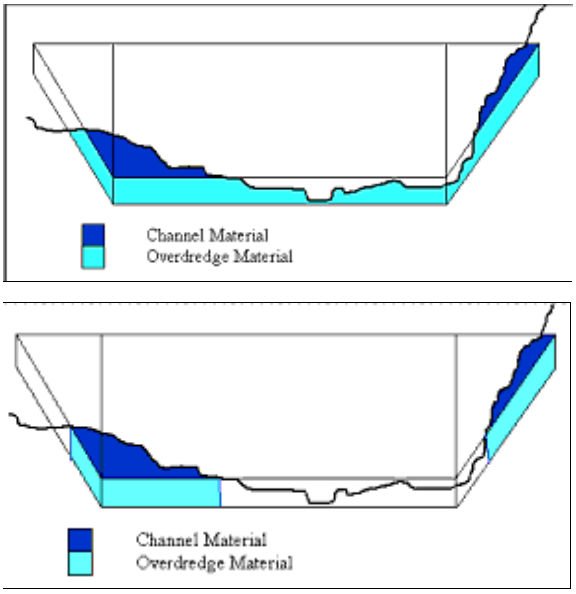
Overdepth determines the overdepth on the slope. A value of 0.00 omits overdredge material in the side slope areas.

The **Shoals Only** option affects the Toe Pay volumes calculations of overdredge material in the extension areas only.

- **Select Shoals Only** to include overdredge material in the extension area only if the depth at the toe line is less than the channel depth. Shoals Only overrides the Non-contour option.
- **Clear Shoals Only** to include all of the overdredge material in the extension areas. Contour overrides this option in the extension areas.

Contour includes overdredge material only if the depth is less than the channel depth. Contour overrides the All Toe Pay option in the extension areas. Clear this option to include all overdredge material. It is overridden in the extension areas by the Shoals Only Toe Pay option.

FIGURE 7-21. *Side Slope Non-Contour (top) vs Side Slope contour (bottom)*



A **box template** omits the side slope and places a vertical line from the toes.

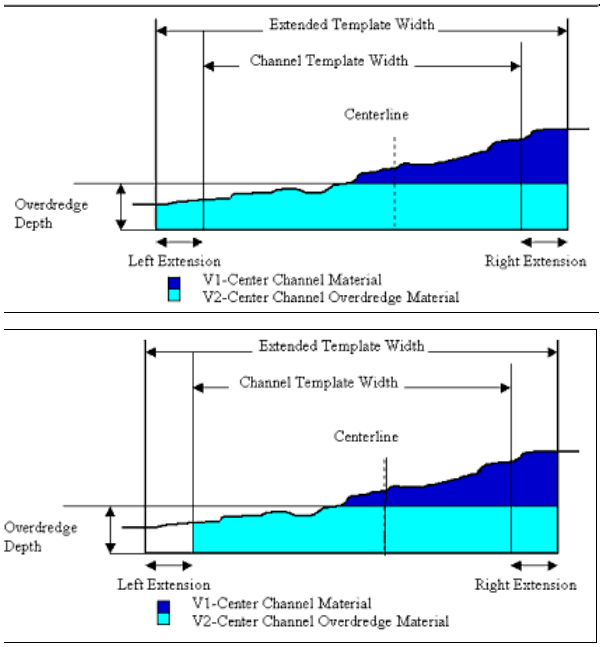
To use box templates, clear the Slope checkbox.

- **Left and right extensions** extend the box template by a user-specified distance.
- The **Above Channel** and **Overdredge** volumes may then be calculated for each segment (Left and Right Extensions, Left and Right of Center line). Select those segments for which you want to calculate volumes using the corresponding check boxes.

Volumes calculations using the box template will be affected by both the Toe Pay and Dredging Options.

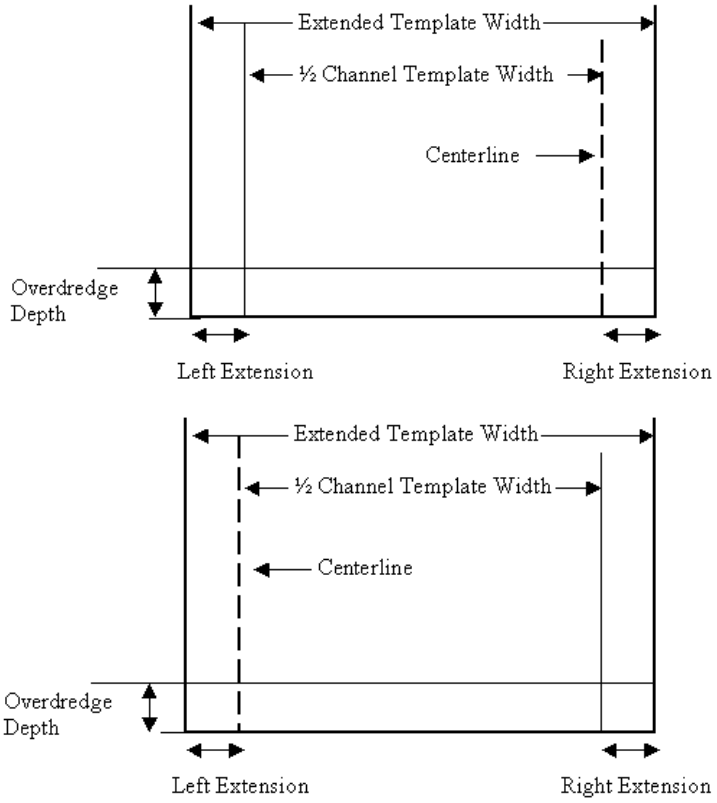
The following figure illustrates how the Toe Pay and Dredging Options affect each other.

FIGURE 7-22. *Non-Contour Dredging with the 'All Toe Pay' Option (top) vs 'Shoals Only' Toe Pay Option (bottom)*



Left Box and **Right Box** offer two additional choices here that are not available in the CROSS SECTIONS AND VOLUMES program. Just as the Box option specifies using the box template, these options tell the program to use a box template. In these cases, however, the template will be based on the left or right toe, the center line and the channel template information left or right of the center line. Any extensions will be added beyond the toe on one side and beyond the center line on the other side.

FIGURE 7-23. *Left Box Template (left) and Right Box Template (right)*



Channel Depth is a quick and easy way to vary the design depth used in the volumes calculations from the original template depth.

Show Picture allows your TIN Model to draw to the screen as the calculations progress. Volumes are calculated in cubic meters for metric grids and cubic yards for foot grids.

The **Philadelphia Pre-dredge** method uses one TIN surface and calculates volumes between a survey depth and the channel template.

FIGURE 7-24. *Sample Philadelphia Pre-Dredge Volumes Report*

Section to Section	Project Depth	Over Depth	Left Extension	Right Extension
0+00 to 28+99	50.00	52.00	25.00	25.00

Pre Dredge report	Reference depth = 50.00				Overdepth = 52.00			
Section Name	Left Box	Left Channel	Right Channel	Right Box	Left Box	Left Channel	Right Channel	Right Box
0+00 to 1+00	1345.01	8746.15	9375.55	1282.63	185.15	1633.13	1828.41	185.17
1+00 to 2+00	1376.13	8897.72	9648.84	1249.26	185.17	1631.51	1833.23	185.17
2+00 to 3+00	1362.63	8908.39	10065.61	1298.53	185.22	1630.37	1838.67	185.25
3+00 to 4+00	1333.98	8905.37	10161.80	1367.70	185.19	1628.27	1842.61	185.15
4+00 to 5+00	1349.13	8956.22	10214.35	1338.70	185.23	1627.02	1848.05	185.23
5+00 to 6+00	1348.27	8936.64	10330.52	1347.03	185.16	1624.77	1852.09	185.16
6+00 to 7+00	1354.77	8910.36	10370.96	1352.97	185.09	1622.51	1856.32	185.12
7+00 to 8+00	1353.35	8881.80	10447.44	1350.28	185.24	1622.06	1862.31	185.23
8+00 to 9+00	1342.73	8804.01	10409.98	1329.72	185.22	1620.19	1867.01	185.23

```
Dredging Quantity Summary
=========================
Total Material to Project Depth ........ 659657.73
Total Allowable Overdepth ............... 118541.42
Total Pay Price ......................... 778199.15
```

The **Philadelphia Post-dredge** method uses two TIN surfaces. It calculates the difference in volumes between two surveys of the same area.

FIGURE 7-25. *Sample Philadelphia Post-dredge Report*

Section to Section	Project Depth	Over Depth	Left Extension	Right Extension
0+00 to 28+99	50.00	52.00	25.00	25.00

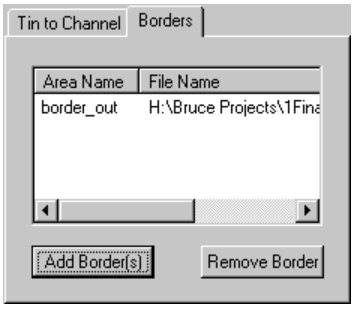
Post Dredge report	Reference depth = 50.00				Overdepth = 52.00			
Section Name	Left Box	Left Channel	Right Channel	Right Box	Left Box	Left Channel	Right Channel	Right Box
0+00 to 1+00								
Before	1344.72	8745.17	9367.19	1283.16	185.15	1633.13	1828.41	185.17
After	1430.21	8160.39	8682.80	900.68	185.15	1633.13	1828.41	185.17
Removed	-85.49	584.78	684.39	382.47	0.00	0.00	0.00	0.00
1+00 to 2+00								
Before	1376.31	8898.53	9651.91	1251.14	185.17	1631.51	1833.23	185.17
After	1455.27	7635.37	8848.03	873.39	185.17	1631.51	1833.23	185.17
Removed	-78.96	1263.16	803.88	377.75	0.00	0.00	0.00	0.00

```
Pre/Post Dredging Quantity Summary
==================================
Total Removed to Project Depth .........      92004.42
Total Pay Removed in Overdepth .........          0.00
Total Pay Removed ......................      92004.42
Total Removed ..........................      92004.42

Total Remaining Above Project Depth ....     564235.51
Total Overdredged Material .............         -0.00
Total Infill Material...................       5343.53
```

RESTRICTING VOLUMES CALCULATIONS WITH BORDER FILES

TIN-to-Channel, TIN-to-Level and TIN-to-TIN calculations can be limited to user-defined areas by adding one or more borders in the Borders tab.

FIGURE 7-26. *Managing Border Files in TIN MODEL*



To Add a Border, click [Add Border]. A File Open dialog will appear to select the border defining the area where you want to calculate volumes. All Border files affecting the volume calculations will appear in the list in the dialog.

To Remove a Border, select a border file in the list and click [Remove Border].

EXAMPLES OF VOLUMES BASED ON SURFACE CALCULATIONS

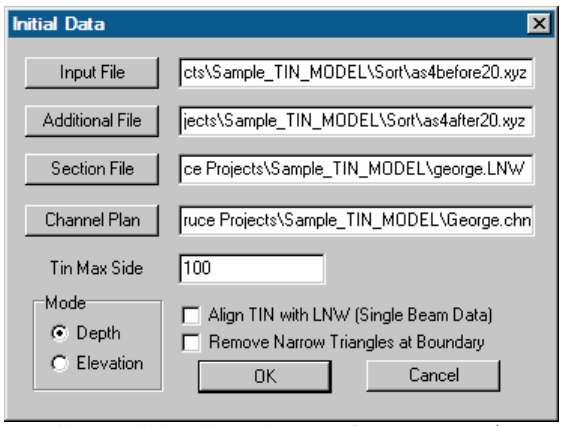
The following sections examine practical examples of working with the TIN Model to create volumes computations.

We can create TIN model with all of the information for all of the computations. The program will, in most cases, use the data necessary for your selected type of computation and ignore the rest. The exception is the Philadelphia method where the presence or absence of the Additional file signals that it is a pre-dredge or post-dredge report.

The following examples will use a model using data from the Sample TIN Model project.

1. **Check your survey units in GEODETIC PARAMETERS.** The project's distance units determine the units used to calculate your volumes. A metric grid results in cubic meters volumes calculations while a foot grid results in cubic yards.
2. **Open the TIN MODEL program** by selecting FINAL PRODUCTS-TIN MODEL or by clicking on the TIN Model icon.
3. **Select FILE-NEW** and the Initial Data dialog will appear.
4. **Fill in the Initial Data dialog**. Select your Input and Channel Plan files by clicking the button next to each field and selecting the appropriate file. Set the TIN Max Side to 100.
5. **Click [OK]** and your TIN Model will be generated.

FIGURE 7-27. *Initial Data Dialog for the Volumes Examples*



6. **Select CALCULATE-VOLUME.** The Volumes **Calculation** dialog will appear.

COMPUTING THE VOLUME OF A TIN VS CHANNEL

Example:TIN vs Channel:

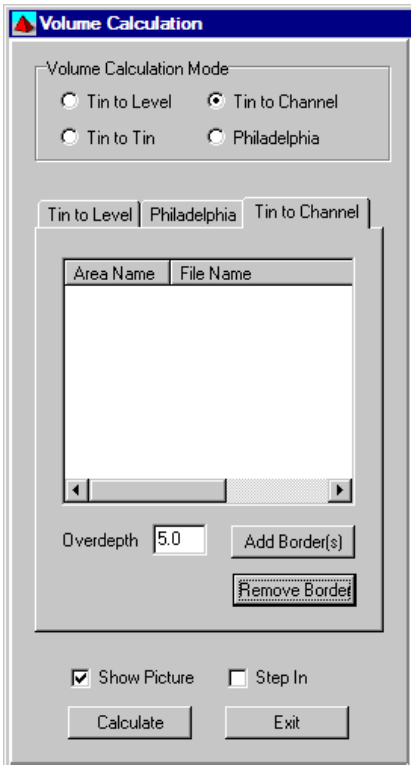
In the Sample TIN Model, compute the total volume in square meters between the gridded multibeam data in the As4before20.XYZ file project's sort directory and the George.CHN channel file.

Solution:

Select TIN-to-Channel and click [OK]. The program will calculate the difference between the survey data and the channel surface. It will only calculate where the two surfaces overlap.

The following figure shows the final result.

FIGURE 7-28. *Volume Calculation Control Dialog*



Under “Channel Volume Totals”

- 1,805,001.96 m^3 (Volume Above) to get down to template depth.
- 7922534.69 m^3 (Volume Below) is the amount of fill needed to fill in between the template and that part of the channel below the template depth.

FIGURE 7-29. *The Resulting Calculations*

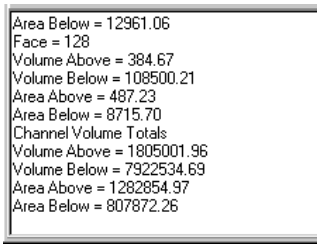


FIGURE 7-30. *Volumes Report*

Volume unit: Cubic Yard

Face	Volume Above Channel	Volume Below Channel	Area Above Channel	Area Below Channel
1	97.51	3733.23	1302.47	8245.72
2	1791.23	0.00	22392.24	0.00
3	942.09	0.00	22560.73	0.00
4	44.45	4770.93	898.31	9230.48
5	97.57	4414.30	1306.45	8933.68
6	1762.77	0.00	22445.00	0.00
7	881.90	0.00	22545.96	0.00
8	41.42	4816.97	877.47	9314.51
9	86.07	4588.73	1208.12	9188.71
10	1712.51	0.00	22454.09	0.00
11	788.59	0.00	22548.18	2.11
...	...	...	...	...
121	118.08	3842.67	1467.26	8756.37
122	1052.86	311.21	12683.48	9772.20
123	291.36	289.24	9811.29	12723.66
124	15.70	4739.03	524.61	9632.97
125	109.97	3557.13	1371.85	8155.55
126	932.57	230.14	12255.93	9113.95
127	230.48	290.17	8520.14	12961.06
128	14.25	4018.53	487.23	8715.70
otal	66851.92	293427.21	1282854.97	807872.26

COMPUTING THE VOLUME OF A TIN VS A USER-DEFINED LEVEL

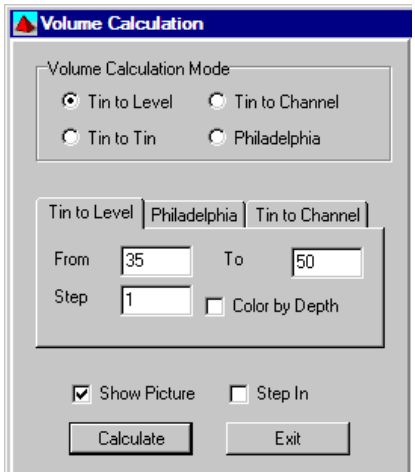
Example: TIN Volume vs Level

In the Sample TIN Model project, compute the volume of the TIN surface created with the as4after20.xyz data above and below level at 5 meter increments from 35 to 50 meters.

Solution:

1. In the **TIN-to-Level Settings**, enter:
   - From=35
   - To=50
   - Step=5.

FIGURE 7-31. *TIN-to-Level Volume Calculation Control dialog*



2. **Click [OK]** and the program will calculate the difference between the survey data and each of the specified levels of 35, 40, 45 and 50 meters.

The Figure 7-32 shows the results after the calculations for the first two levels have been completed. The remaining volumes would also be calculated and the results appended.

For each level, we see both the volume of material as well as the surface area above and below the specified level.

FIGURE 7-32. *The Resulting TIN-to-Level Model*

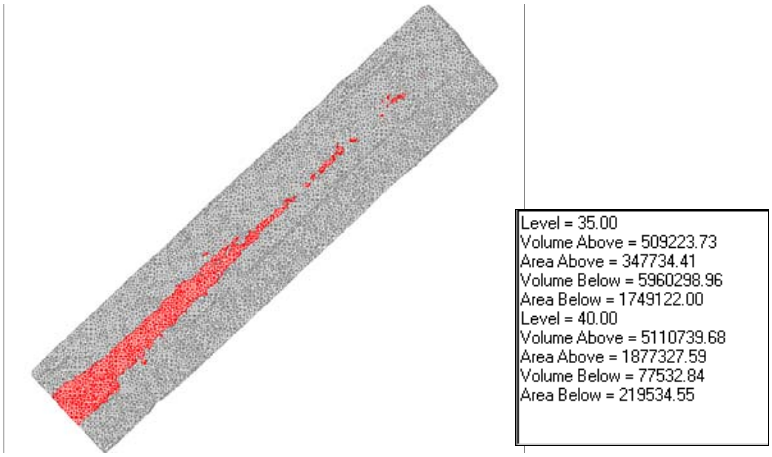


FIGURE 7-33. *TIN-to-Level Volumes Report*

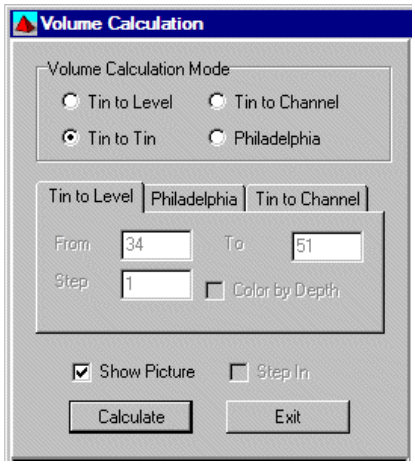
```
Tin File: C:\Bruce Projects\Sample_TIN_MODEL\Sort\as4before20.xyz
Additional File: C:\Bruce Projects\Sample_TIN_MODEL\Sort\as4after20.xyz
Section File: C:\Bruce Projects\Sample_TIN_MODEL\george.LNW
Channel File: C:\Bruce Projects\Sample_TIN_MODEL\George.chn
Vertical Orientation: Depth Mode
Tin Alignment: off

Maximum Leg: 100.00
X Maximum: 1540742.23
X Minimum: 1537990.57
Y Maximum: 608015.03
Y Minimum: 605368.22
Z Maximum: 41.65
Z Minimum: 29.99
Number of Points: 10746
Number of Triangles: 21490

Volume unit: Cubic Yard
Level     Volume Above    Area Above      Volume Below    Area Below
--------------------------------------------------------------------------
   35.00        18860.14       347734.41       220751.81      1749122.00
   40.00       189286.65      1877327.59         2871.59       219534.55
```

CALCULATING VOLUMES BETWEEN TWO TIN MODELS

Example:TIN vs TIN

The TIN–to-TIN calculation computes the volumes of TIN1 above and below TIN2. In this example, TIN MODEL creates two surfaces—one for the Input file (TIN1) and one for the Additional File (TIN2) specified in the Initial Data dialog. It then compares the two surfaces and calculates the volume of material from TIN1 which falls above and below TIN2.

FIGURE 7-34. *TIN-to-TIN Volumes Calculation Controls*



Select TIN-to-TIN and click [OK]. The program will calculate the volumes of TIN1 above and below TIN2.

FIGURE 7-35. *TIN-to-Level Volumes Calculation Control*

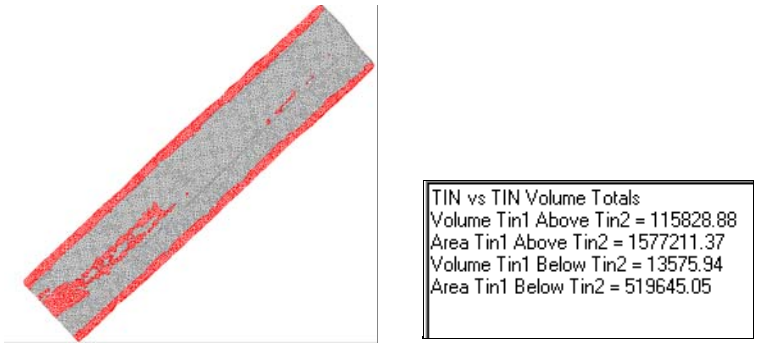


FIGURE 7-36. *TIN-to-TIN Volumes Report*

```
TIN vs TIN Volume Totals
Volume unit: Cubic Yard
Volume Tin1 Above Tin2 = 115828.88
Area Tin1 Above Tin2 = 1577211.37
Volume Tin1 Below Tin2 = 13575.94
Area Tin1 Below Tin2 = 519645.05
```

PHILADELPHIA VOLUMES

Philadelphia volumes calculations can be pre-dredge or post-dredge calculations. In this case, the Initial Data available determines if TIN MODEL creates a pre-dredge or post-dredge report. If an Additional file is included, TIN MODEL assumes it is a post-dredge report.

PHILADELPHIA PRE-DREDGE VOLUMES

Pre-dredge calculations require a 3-dimensional Sections file and calculate the volumes above and below the channel template. The Philadelphia method allows you to omit the slope and substitute a box extension beyond the toes. You can also choose to use Contour or Shoals Only methods of calculating your overdredge material.

FIGURE 7-37. *Pre-dredge Settings*

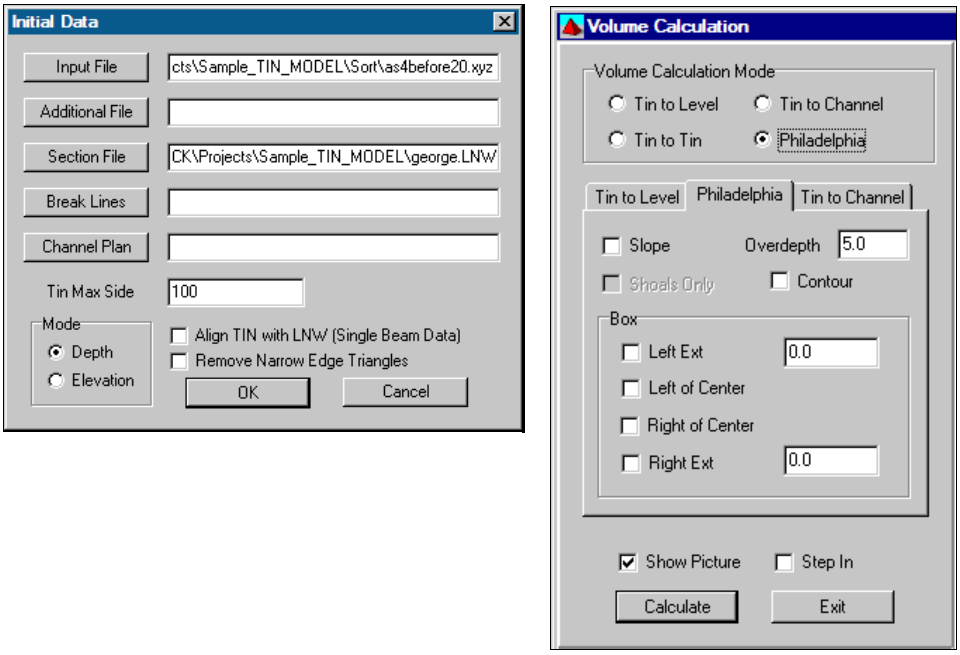
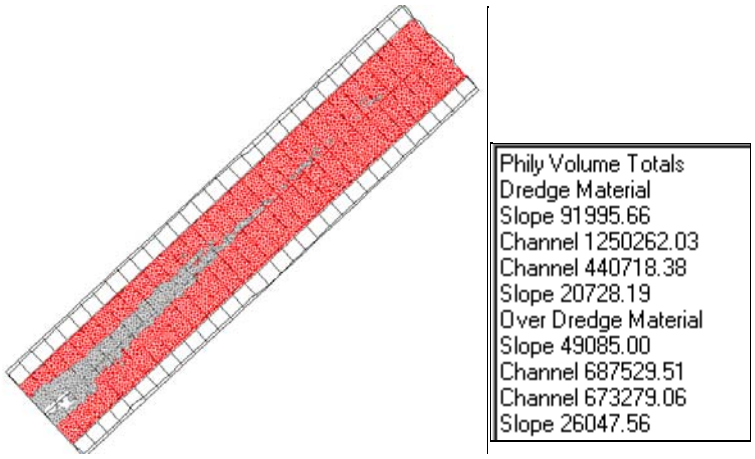


FIGURE 7-38. *Pre-dredge Results*



The Volumes Report can be viewed or printed through the Export menu. The following figure shows a portion of a sample report. The volumes for each segment of each line is listed and the totals of each are calculated at the end.

FIGURE 7-39. *Predredge Report*

Section to Section: 211+000 to 214+200 | Project Depth: 40.00 | Over Depth: 41.00 | Left Slope: 120/40 | Right Slope: 120/40

Pre Dredge report — Reference depth = 40.00 — Overdepth = 41.00

Section Name	Left Slope	Left Channel	Right Channel	Right Slope	Left Slope	Left Channel	Right Channel	Right Slope	
211+000 to 211+100		2636.05	47000.80	25478.69	1197.37	1463.51	21878.41	22561.25	1064.30
211+100 to 211+200		2639.48	47650.12	23812.60	1121.81	1472.28	22445.86	22546.34	1054.99
211+200 to 211+300		2324.30	46297.25	21238.94	1028.65	1368.33	22454.27	22550.62	1019.89
211+300 to 211+400		2421.80	45824.20	20350.13	957.11	1396.81	22446.35	22545.83	966.80
211+400 to 211+500		2415.98	44481.79	17204.51	680.53	1395.23	22451.72	22512.61	841.52
211+500 to 211+600		2504.88	41766.87	14715.28	629.31	1427.18	22445.34	22482.99	805.18
211+600 to 211+700		2235.85	40601.46	15665.29	632.20	1365.12	22455.63	22545.88	795.01
213+700 to 213+800		4142.25	33714.80	11119.54	593.23	1865.59	21597.11	19695.35	833.78
213+800 to 213+900		2850.75	24299.14	10579.63	654.59	1619.06	19621.12	19089.55	879.22
213+900 to 214+000		2702.62	20844.84	9138.81	543.16	1547.50	17814.59	17132.48	790.26
214+000 to 214+100		3182.49	28379.12	7894.97	424.15	1642.62	14576.08	15003.43	688.49
214+100 to 214+200		2858.29	24825.90	6157.70	375.58	1486.63	15260.21	13784.07	631.44
Total:	91995.66	1250262.03	440718.38	20728.19	49085.00	687529.51	673279.06	26047.56	

Dredging Quantity Summary

Total Material to Project Depth 1803704.26
Total Allowable Overdepth 1435941.13
Total Pay Price 3239645.39

PHILADELPHIA POST-DREDGE VOLUMES

Post-dredge calculations require an Additional file along with the Sections file and calculates the volumes between each TIN surface and the channel, then computes the difference. The box and contour options are also available in post-dredge calculations.

FIGURE 7-40. *Sample Philadelphia Post-dredge Settings*

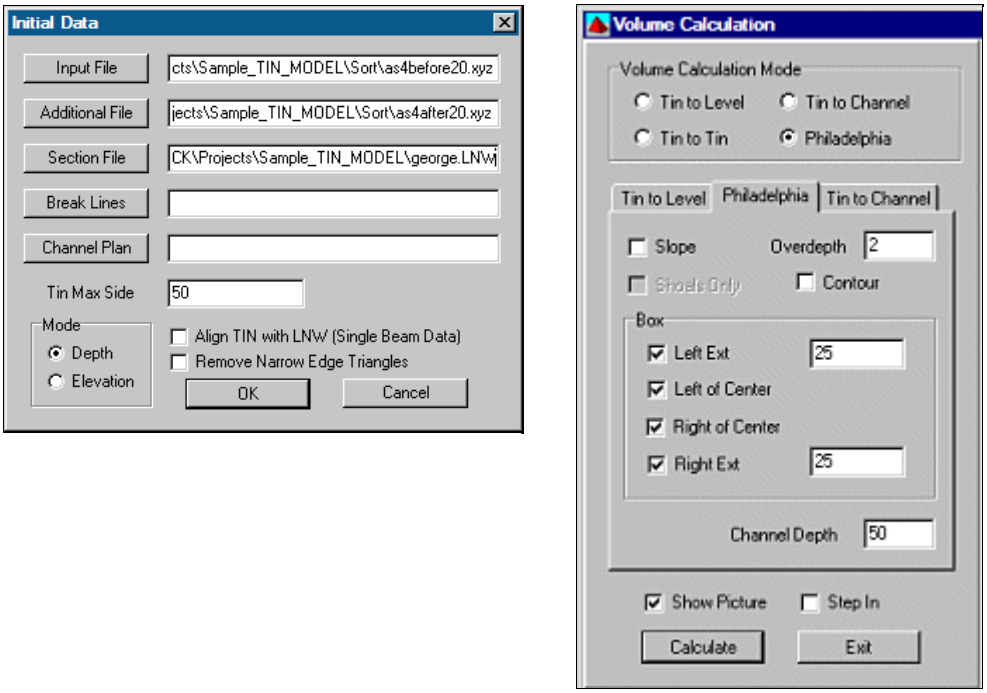
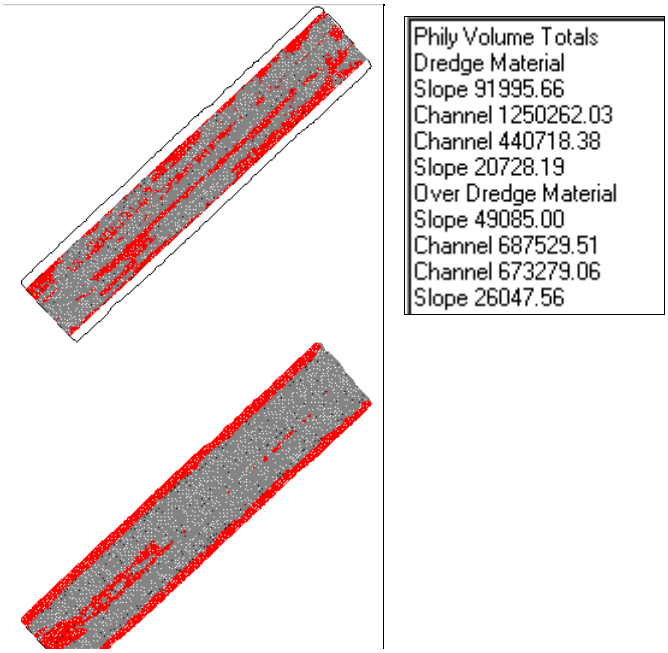


FIGURE 7-41. *Philadelphia Pre-dredge Results*



The post-dredge volumes report calculates the same volumes, but this time for two surfaces, and then calculates the difference for each line. The totals are again, listed at the bottom.

FIGURE 7-42. *Sample Post-dredge Report*

```
Philadelphia Post-Dredge (Tin to Tin) Report
Dredge File: C:\HYPACK\Projects\Sample_TIN_MODEL\Sort\as4before20.xyz
Post-Dredge File: C:\HYPACK\Projects\Sample_TIN_MODEL\Sort\as4after20.xyz
Line File: C:\HYPACK\Projects\Sample_TIN_MODEL\george.LNW
Method: Box Cut
Dredge Option: Contour
To Pay: All
Volume unit: Cubic Meter

Section to          Project     Over        Left        Right
Section             Depth       Depth       Extension   Extension
 211+000 to  214+200    40.00       42.00       25.00       25.00

Post Dredge report      ---------- Reference depth = 40.00 ----------   ---------- Overdepth = 42.00 ----------
Section             Left        Left        Right       Right       Left        Left        Right       Right
Name                Box         Channel     Channel     Box         Box         Channel     Channel     Box
----------------    ---------   ---------   ---------   ---------   ---------   ---------   ---------   ---------
 211+000 to  211+100
Before              10828.34    47225.31    25437.88    7836.57     4997.67     43880.06    45122.51    5002.50
After               1099.39     881.98      232.70      1681.58     2889.79     6736.17     2828.03     4984.98
Removed             9728.95     46343.33    25205.18    6154.99     2107.88     37143.89    42294.48    17.51
 211+100 to  211+200
Before              10839.45    47597.14    23811.93    7737.71     4999.02     44891.71    45092.68    4999.25
After               2127.70     2942.41     99.31       1521.93     4696.83     17821.67    1135.90     4790.06
Removed             8711.75     44654.73    23712.62    6215.78     302.19      27070.05    43956.78    209.19

Before:             362087.37   1249880.09  440867.79   195977.99   159587.96   1299593.80  1135851.70  1597
After:              62014.63    76629.65    13468.31    46535.44    124388.89   582953.95   400614.14   108444.64
Removed:            300072.74   1173250.43  427399.48   149442.55   35199.07    716639.86   735237.57   5132

Pre/Post Dredging Quantity Summary
==================================
Total Removed to Project Depth .....    2050165.21
Total Pay Removed in Overdepth .....    1538401.26
Total Pay Removed ..................    3588566.48
Total Removed ......................    3122567.97

Total Remaining Above Project Depth ....    198648.03
Total Overdredged Material .............    -465998.51
Total Infill Material...................    362536.84
```

EXPORT

EXPORT converts HYPACK® data files to other formats. The primary formats supported are DXF, DWG, DGN and XYZ.

HYPACK® File to CAD — You can convert most HYPACK® files to DXF, DWG or DGN format. This can be very useful if you integrate HYPACK® data with work in CAD systems or if you want to display them as chart data in HYPACK®.

CAD to XYZ — You can also convert point and text objects from DXF, DWG or DGN files (as well as a few HYPACK® files) to XYZ format.

This two-way file conversion capability gives you several options.

- **Export the sounding data from the charts to XYZ format**, which can then be displayed in HYPACK® or loaded to several of the other program modules.
- **Convert the chart files to TIN models** by exporting the chart data to XYZ format, then loading the resulting file to the TIN MODEL program.
- **Append XYZ sounding data to your chart file** and display all of the data as a background file in HYPACK® or your favorite CAD program.
- **All Format and XYZ to Custom Formats**All Format and SWP sounding files can be exported to a choice of several custom formats.

The following table summarizes the types of conversions possible through the EXPORT program

TABLE 7-1. *EXPORT Conversion Summary.*

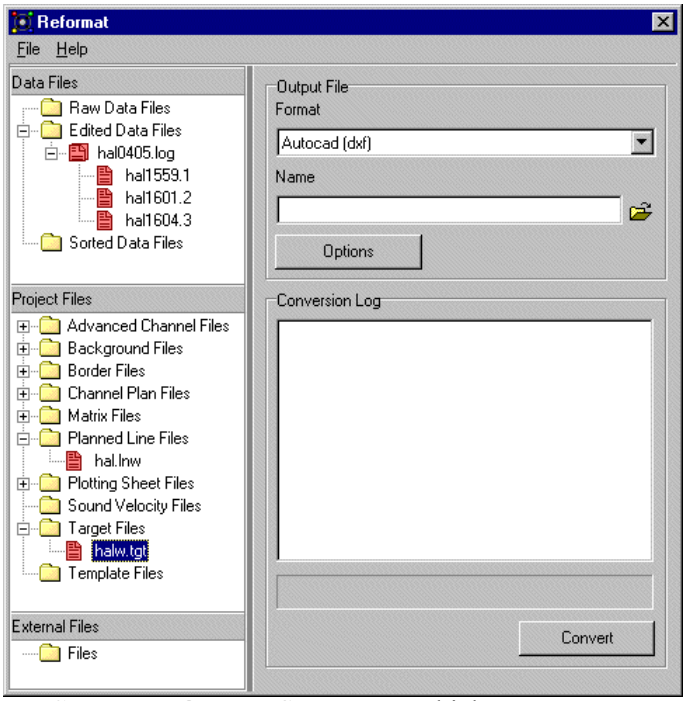
Input Format			Output Formats
DIG	LNW	PLT	DXF
DWG	PLN	XYZ	DWG
CHN	Tics	BKT	DGN
DXF	LNW	XYZ	KML
MTX	TGT	Track lines	
DGN	DXF		XYZ

Input Format			Output Formats
ALL	SWP		DXF DWG DGN XYZ (and variations) Custom Formats
TGT BRD			DXF DWG DGN XYZ

RUNNING THE EXPORT PROGRAM

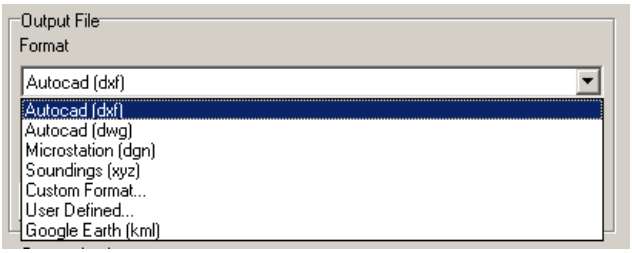
1. **Start the EXPORT program** by selecting FINAL PRODUCTS-EXPORT. All files associated with the project are loaded in their current enabled or disabled state to the EXPORT interface.

FIGURE 7-1. *The Main Window of the EXPORT Program*



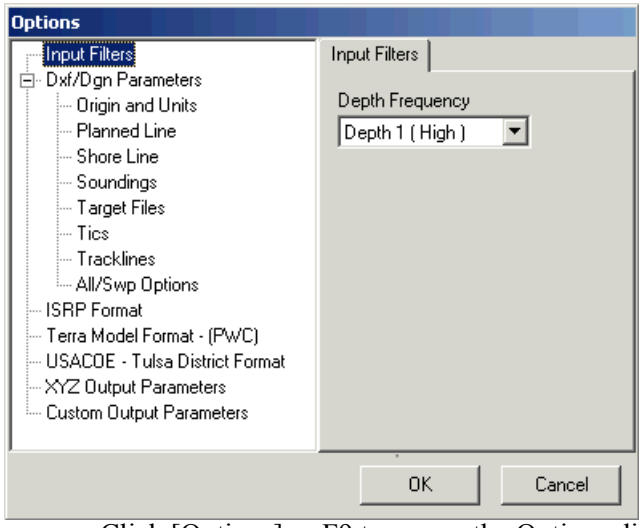
2. **Select the Output file type** to which you want to export from the Output File Format drop-down menu.

FIGURE 7-2. Selecting the Target Format



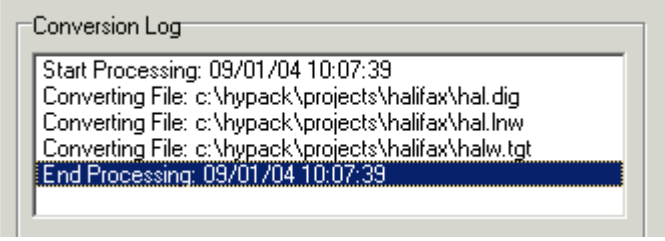
3. **Click the File Open icon and name your output file.** The path will default, in most cases, to your project directory. XYZ output formats default to the Sort directory.
4. **Select the file or files you want to convert** by enabling and disabling them in the file tree on the left side of the window as you would in the main HYPACK® screen. Files of types that can not be converted to the designated output format are marked with X's.
5. **Add External files (optional).** These are files that were not part of your project when you started EXPORT TO CAD, but you want to add them to your exported project data. Select FILES-ADD FILES or right click on the Files folder in the External Files list and select "Add File(s)". A File Selection Dialog will appear for you to browse for additional files.
6. **Set your Input and Output Options**.

FIGURE 7-3. Export Options Dialog



   a. Click [Options] or F9 to access the Options dialog.
   b. For each option applicable to your output file type on the left, select the option and set the related options displayed on the right.
   c. Click [OK].
7. **When your list is complete and all parameters have been set, click on [Convert]** (or select FILE-CONVERT). The conversion will be made and you can see its progress in the conversion log which is displayed on the screen.

FIGURE 7-4. *Conversion Log*



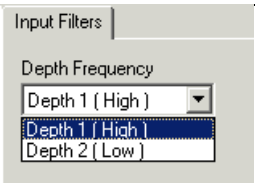
NOTE: This will show which files have been successfully converted and if, for some reason, any have not.

EXPORT OPTIONS IN EXPORT

INPUT OPTIONS IN EXPORT

For dual frequency data, use this dialog to elect to convert either Depth 1 or Depth 2 to your exported files.

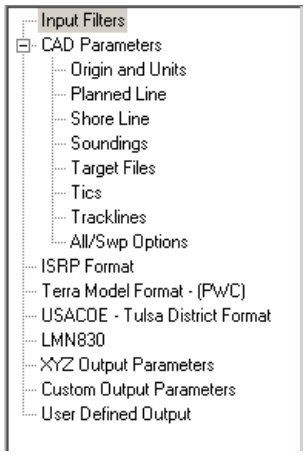
FIGURE 7-5. *Input Filters*



CAD OUTPUT SETTINGS IN EXPORT

Define the output settings pertinent to creating DXF, DGN or DWG Files and the Source File types you are exporting to them. The Origin and Units information must only be provided if you are converting to DGN format.

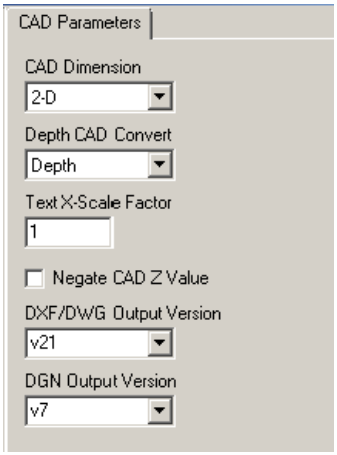
FIGURE 7-6. CAD Parameters Menu



CAD PARAMETERS

The CAD settings are for creating the chart regardless of which features are included.

FIGURE 7-7. CAD Parameters Dialog



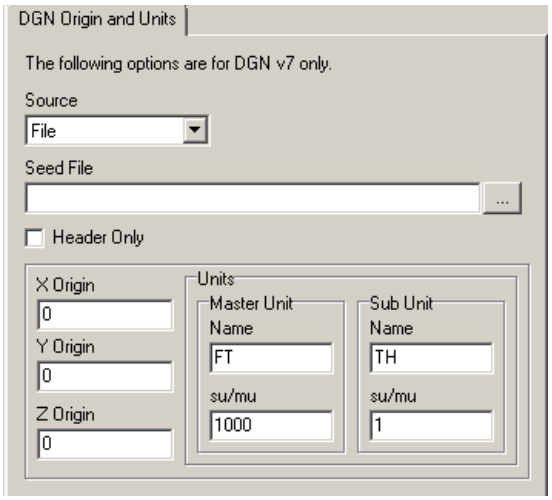
- **CAD Dimension:** Choose 2D or 3D. This option is especially important if you are converting soundings. Select 3D to show the Z value.
- **Depth CAD Convert:** Since the HYPACK® convention is positive downward and CAD convention is negative downward, you can use this option to invert the text representing your sounding values in your CAD output..
- **Text X-Scale Factor:** Scales the text width to the user-specified text height.
- **Negate CAD Z Value** inverts the Z value in the *output file only.* This affects the 3D behavior of the layers in CAD. It does not invert the input depths.
- **DXF/DWG Output Version** and **DGN Output Version**: Select the output version number for in the field appropriate to your chosen output format.

DGN Origin and Units

The DGN Origin and Units are used for two purposes:

- To combine project data with previously created DGN data (the seed file)
- To specify the origin, Master Unit and Sub Unit for a new DGN file.

FIGURE 7-8. *DGN Parameters Window*



Source enables you to select a DGN file from which you will read all data or only the header information. Reading the data will combine all data together in your exported DGN file.

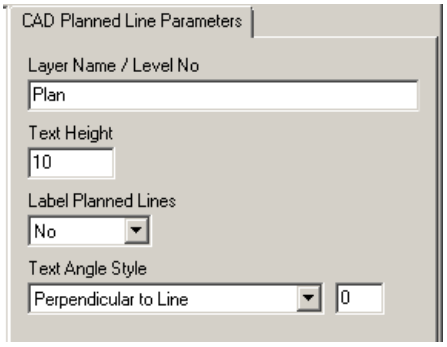
Header Only reads the header from a previously created DGN file—the **Seed File**--to the header of the one you are creating, thus assuring the two files will overlay accurately.

Export File	Source	Header Only	XYZ, mu +su
New DGN	Custom	No	Yes
New DGN to overlay Existing DGN	File + Seed File	Yes	No
New DGN combining Existing DGN with new data	File + Seed File	No	No

CAD Planned Line Parameters

The Planned Line Parameters set what layer (DXF or DWG) or Level (DGN) in the output file the survey lines will be and provides labeling directions.

FIGURE 7-9. Planned Lines Parameters Window



Layer Name / Level Number is the layer or level your data will be written on in AutoCAD.

To label the survey lines, set Label Planned Lines to True and enter the Text Height and Angle Style.

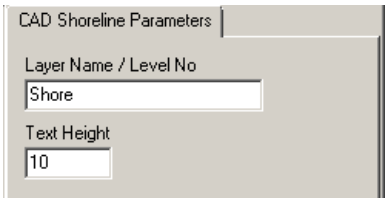
Text Height is based upon "drawing units", which will usually be feet or meters.

Text Angle Style can either be written perpendicular to the planned line, or at a user-defined, fixed angle.

CAD Shoreline Parameters

The Shoreline Parameters set the location and label size of exported shoreline files. The options are like the Planned Line Parameters.

FIGURE 7-10. Shoreline Parameters Window

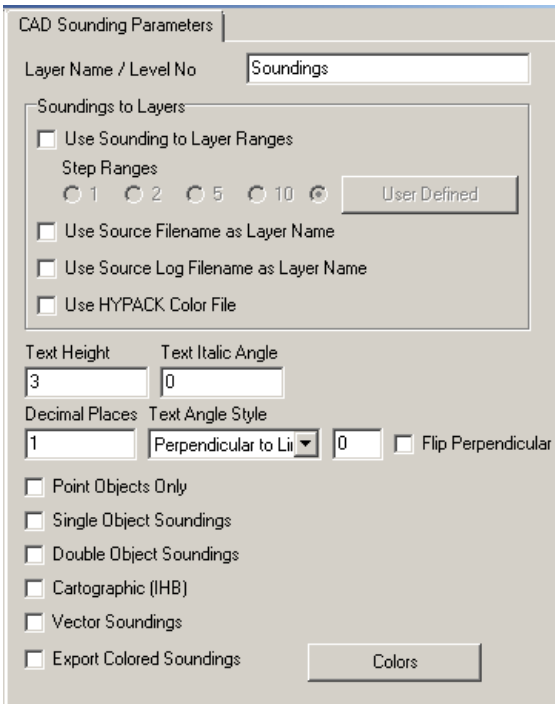


CAD Sounding Parameters

The Sounding Parameters dialog defines how soundings will be output to the CAD output file. The input sounding file may be All or XYZ format.

NOTE: Be sure to check the 3D CAD Dimension in the CAD Parameters. 2D DXF's contain no Z values, which defeats the purpose when you are exporting soundings.

FIGURE 7-11. *Sounding Parameters Window*

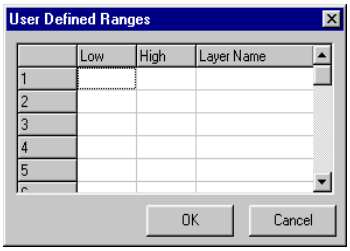


Layer Name/Level Number displays the default layer/level name of "Soundings".

Soundings saved to CAD format can be saved to more than one layer according to depth ranges or source file names.

To create layers based on depth ranges, check Use Sounding to Layer Ranges. You can elect to create a different layer for every 1, 2, 5 or 10 survey units of depth, or you can define your own depth increments. Just click [User-Defined] and enter your depth ranges and layer names to the User-defined Range dialog.

FIGURE 7-12. *User-Defined Depth Ranges for Each Exported Layer*



To create layers by source file name, you must first choose whether to name your layers according to each individual data file name or use the catalog file name. The following table compares each choice where the

input data is the Hal0405.log which contains Hal0405.1, Hal0405.2 and Hal0405.3.

Option	Resultant Layer Name(s)
Use Source File Name as Layer Name	Hal0405_1, Hal0405_2 and Hal0405_3
Use Log File Name as Layer Name	Hal0405

Use HYPACK Color File sets layers and colors objects based on the selected HYPACK® color file (project colors).

Text Height, and **Text Angle Style** are the same as for Planned Lines.

Text Italic Angle affects the amount of slant in italicized text. The results are not visible in HYPACK®; they are only visible in the CAD program.

Decimal Places tells the program how many decimal places to export. Truncation and Rounding Rules are taken from the HYPACK® Control Panel.

Flip Perpendicular: Available only for All or SWP format files when the soundings are written perpendicular to line, this option rotates the text 180 degrees.

Point Objects Only places a dot at the sounding position. In a DXF file, i t will appear as a dot. In a DGN file, it will appear as a small ellipse.

Single Object Soundings and **Double Object Soundings:**.

- The **Single Object Soundings** option exports soundings, each as a complete object on the chart layer/level with the decimal point *approximately* on the sounding.
- The **Double Object Soundings** option places the decimal point separately and *more accurately* at the sounding position.

NOTE: The Single and Double Object Sounding options are unavailable for DGN v7 output.

Cartographic Soundings centers the integer portion of the sounding at the sounding location and then writes a smaller, lower fraction. If this is not selected, the decimal point will be centered on the sounding location. If the sounding is a negative value, the integer is underlined.

TIP: To more accurately position Cartographic soundings in your display, you should also select the Vector Soundings option.

Vector Soundings draws the soundings as a polyline instead of text. This option improves the precision of positioning the soundings in your display because it can better adjust for different fonts and export styles. This option can be used together with the Cartographic Soundings option. Otherwise, it places the decimal at the sounding location.

Export Colored Soundings color-codes the exported soundings according to the current project color settings. You can modify the colors through the standard Color Settings dialog. Click [Colors] to customize your sounding colors.

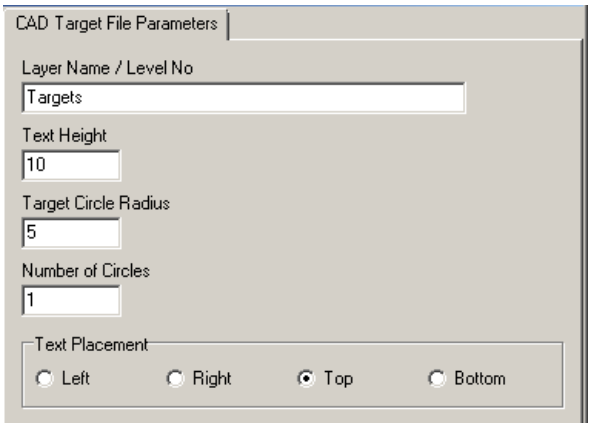
More Information

- "Sounding Color Settings in HYPACK®" on page 1-34

CAD Target File Parameters

The Target File Parameter dialog sets the layer/level number and labeling information. It also enables you to input the Target Circle Radius and the Number of Circles that are drawn around each Target.

FIGURE 7-13. *Target Parameters Window*

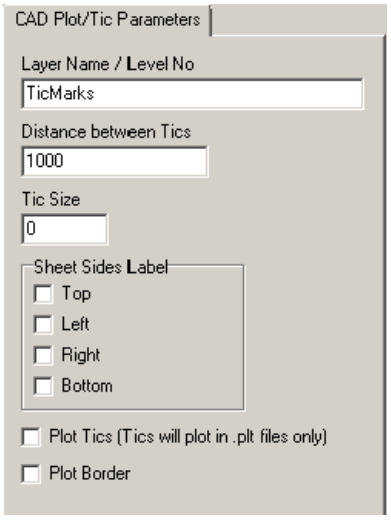


CAD Plot/Tic Parameters

This routine is used to include a Plotting Sheet File (*.PLT) marked with projection tic marks and labels into a CAD drawing. (You probably want only one PLT file enabled at a time.)

In the Plot/Tic Parameters dialog, you can specify whether to draw the plotting sheet border (Plot Border) and grid tics (Plot Tics). You can also enter the Distance Between Tics and Tic Size (measured in "drawing units"—typically feet or meters), and choose on what sides of the plotting sheet area you wish to label the tic marks. The grid labels will be formatted according to the HYPACK® display settings set in the control panel.

FIGURE 7-14. *Tic Parameters Window*



CAD Track Line Export Parameters

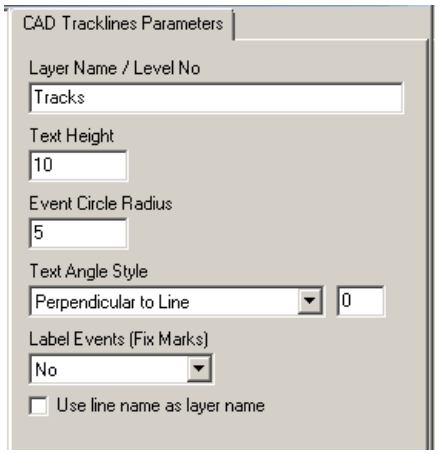
The Track Line Parameters sets labeling information for the event marks on the Track Lines layer.

Elect to label Events by selecting either Events (Event Number) or Time in the Label Events field. Set the **Text Height** and **Text Angle Style** as you did for Planned Lines. A **Circle Radius** greater than 0 draws a circle at that distance around each event.

Use Line Name as Layer Name exports the track line for each survey line to a separate DXF layer and names the layers according to the survey line name. If this is not selected, all track lines will be stored on 1 layer.

NOTE: This option is unavailable for DGN v7 output.

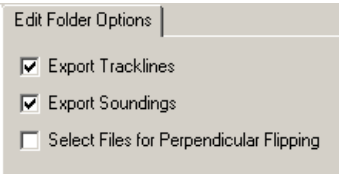
FIGURE 7-15. *Track Line Parameters Window*



Edit Folder Parameters

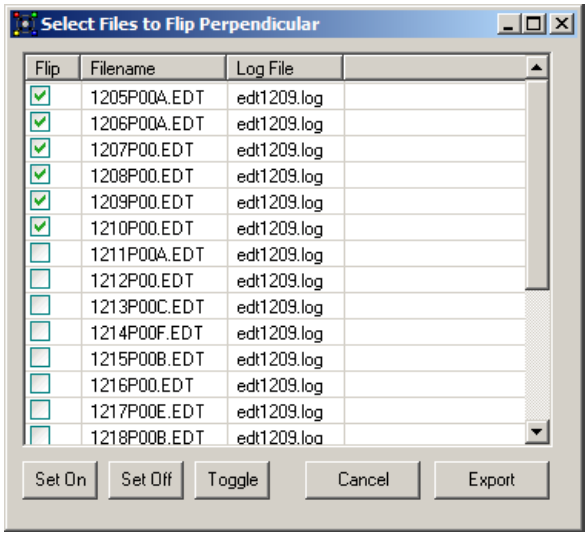
The Edit Folder Options simply give you the choice to export the track lines, the soundings or both.

FIGURE 7-16. *Edit Folder Options*



Select Files for Perpendicular Flipping: Available only for All or SWP format files whose soundings are drawn perpendicular to the line. Check this option and, when you click [Convert], a dialog will appear where you choose the lines on which the soundings will be rotated 180 degrees.

FIGURE 7-17. *Selecting Lines for Perpendicular Flipping*



To select the each line individually, check its associated 'flip' box.

To work with multiple lines:

1. **Select multiple lines by clicking the Filenames.** (The files highlight.) Use the Shift key to select contiguous files or the Ctrl key to select multiple noncontiguous files.
2. **Use the buttons at the bottom to manage the check box status** of the selected files.
   - **[Set On]** checks all selected files.
   - **[Set Off]** clears the checkboxes for all selected files.
   - **[Toggle]** reverses the check status of all selected files.
3. **Click [Export]** to continue the conversion process.

XYZ Parameters in Export

If you prefer to export your data to XYZ format, use the XYZ Parameters to specify how the data will be output. You can use this method to convert a DXF file to a TIN Model. Just export the soundings and

polylines from the DXF file to an XYZ file that can then be used in the TIN MODEL program. You could also export soundings from a DGN or DXF chart by selecting the sounding level/layer and export the soundings to XYZ format which can be displayed in HYPACK®.

Output Format provides a choice of data combinations and orders.

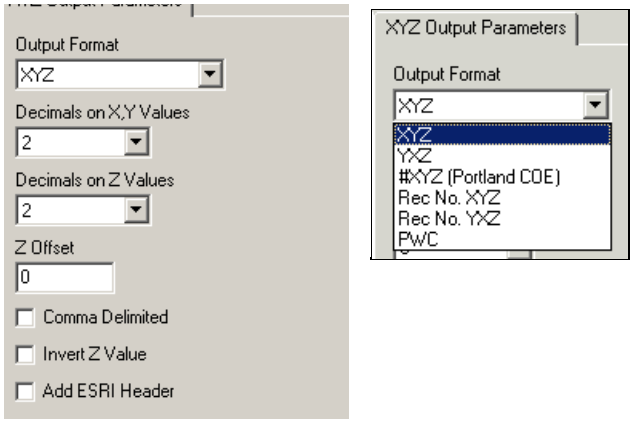
The **Decimals options** set the number of decimal places to be exported with the data. The X and Y values will have the same number of places. You may choose a different number for the Z value.

Comma Delimited set to True will insert commas between each field in the output; otherwise there will be a space.

Invert Z Value negates the current depth value in the export file unless you are also exporting XYZ soundings. In this case, the sign designated for soundings in the XYZ Parameters dialog may override this option.

Z-Offset adds the offset value to the Z value in your data set before it is exported to your file. If you have selected *Invert Z Value*, that operation occurs first. This combination comes in handy for those surveying at elevations but prefer to keep everything in depth mode until the end. In this case, if you have a depth of 20 and Z Offset of 1000, the exported Z value will be 980 (-20 + 1000).

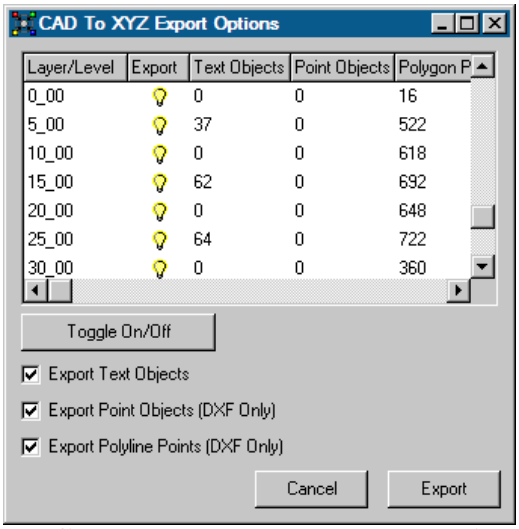
FIGURE 7-18. *XYZ Parameters Window with Output Format Options*



If you are exporting CAD Formats to XYZ, EXPORT analyzes the DXF or DGN file and displays a listing of the layers/levels in the file and the number of convertible (point, polyline and text) objects on each. By default, all of the layers/levels are selected (the light bulb icon is yellow).

1. **Select which layers you want to include** in the exported file by double clicking the corresponding icon in the Export column (or by selecting the icon and clicking [Toggle On/Off]). A gray light bulb is not selected.

FIGURE 7-19. *Exporting CAD to XYZ*



2. **Choose whether to export text, point, polygon objects or any combination** by checking the corresponding check boxes.
3. **Click [Export]** to continue the conversion.

EXPORT converts object type a bit differently as follows:

- **Point objects:** The X,Y,Z values are written to the text file.
- **Text objects:** Writes the X and Y values of the objects, but uses numeric values of the text as the Z value.
- **Polyline Points:** Writes X and Y values of each vertex, but uses 0 as the Z value.

FIGURE 7-20. *Original DXF Chart*

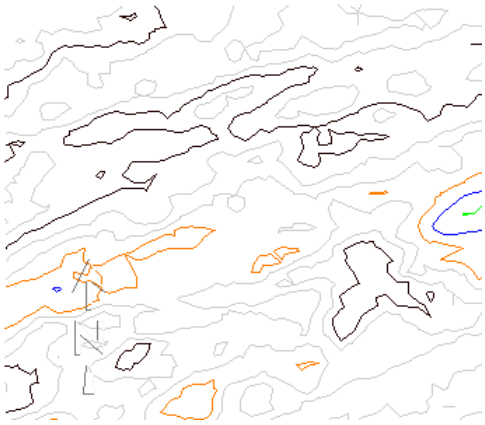
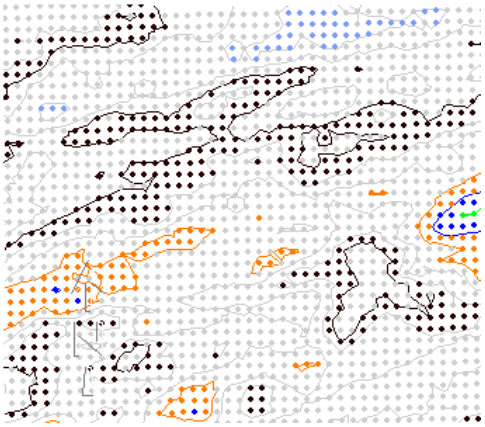


FIGURE 7-21. *Exported XYZ Overlaid on the Original DXF*



CUSTOM OUTPUT FORMATS IN EXPORT

There are several pre-defined custom formats that can be selected in the Custom Formats dialog. The ISRP, Terra Model and Tulsa COE formats require additional information in their corresponding dialog. GPX format has additional options below the output selection..

FIGURE 7-22. *Selecting Custom Output Formats*

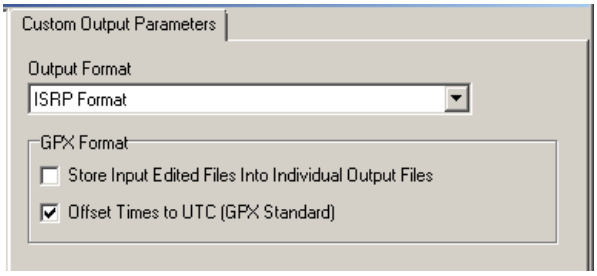
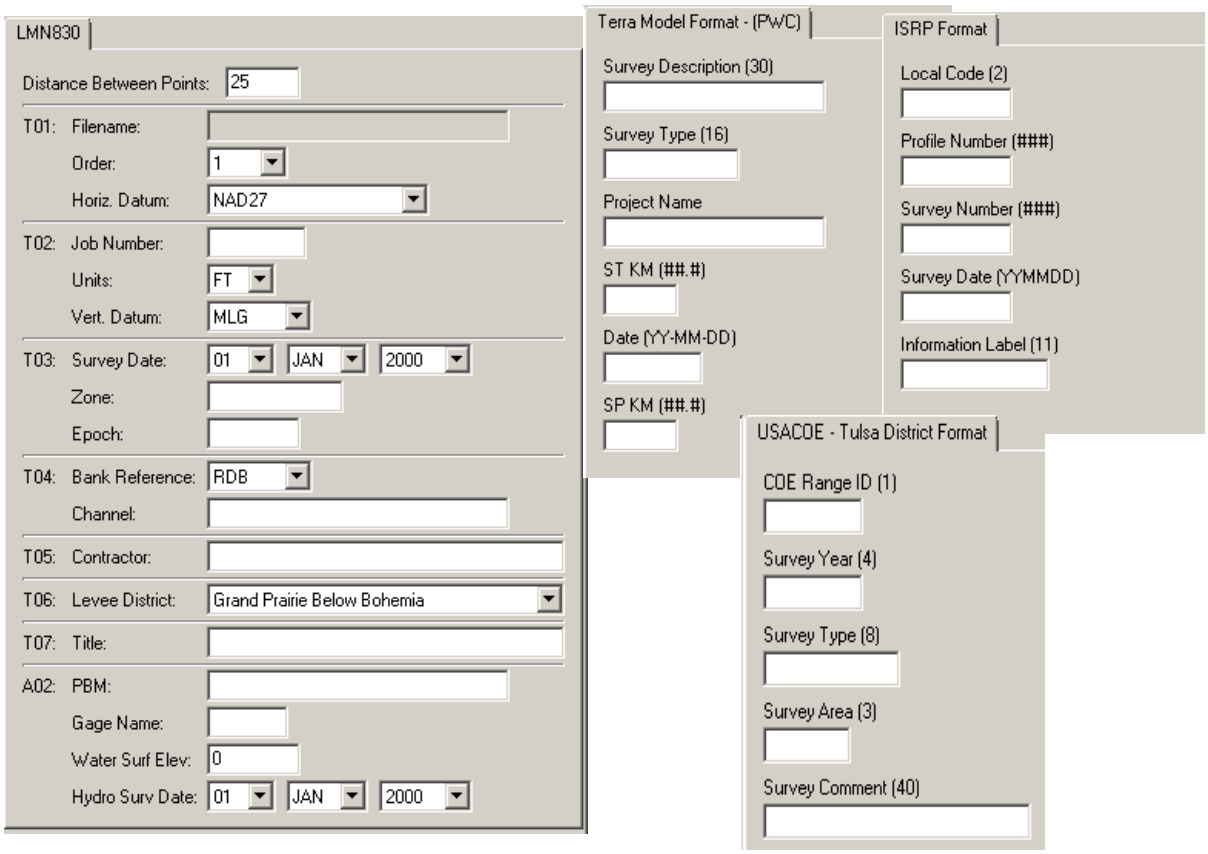


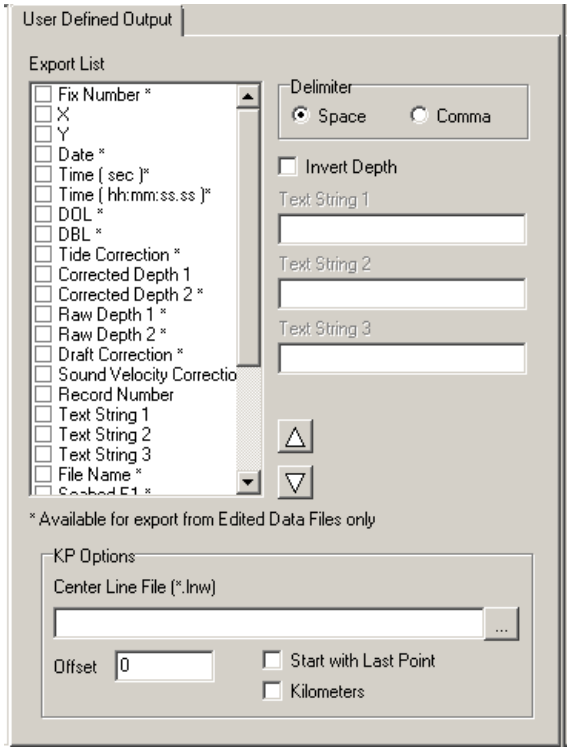
FIGURE 7-23.



USER-DEFINED OUTPUT

The user-defined output options enable you to extract data from edited ALL Format files and custom format your output strings. Just select the User-Defined option and define your ASCII output sequence.

FIGURE 7-24. *User-defined Output Dialog*



1. **Select each item to include** by checking the corresponding checkbox in the list.
2. If you need to **add a constant string that is not listed**, select one of the "Text String" options and type the string in the corresponding field.
3. **Arrange the order of the items** in the string by selecting an item and moving it up or down in the list using the arrow buttons.
4. **Choose the Space or Comma delimiter**.
5. **If you want to invert your depths**, check the "Invert Depth" box.

KP Options: Select the 'KP' export item, you must enter the information in the KP Options section. For each sounding in an XYZ or All format file, the KP item exports the distance from the beginning or end of a user-defined center line.

- **Center Line File:** The line file (*.LNW) defining the center line. It should contain only the center line.
- **Offset**: The distance either side of the defined center line where EXPORT should include.
- **Start with Last Point**: Select this option to export distance from the *end* of the center line.
- **Kilometers**: The default unit of measure is meters. Check this option to output kilometers instead.

The program will take the selected information from each record in the Input file and send it to the specified Output file. Lat/Lon formatting is determined by your settings in the HYPACK® Control Panel.

SETTING EXPORT COLORS WITH SCHEMES

EXPORT colors some chart features according to the current scheme (*.SCX). The following table lists the elements affected by your scheme and where you find them in the SCHEME BUILDER program.

TABLE 7-2. *Exported Files and their Scheme Setting Locations*

Exported Object	Scheme Object
Border Files (Outline and Node Ellipses)	Chart Elements – Border Files
Advanced Channel Files (Faces and Text)	Chart Elements – Advanced Channel Files
Planned Line Files (Lines)	Survey Elements – Planned Lines – Not Yet Run
Planned Line Files (Text)	Survey Elements – Planned Lines – Text (Color Only)
Matrix Files (Border)	Survey Elements – Matrix Outline – Not Active
Channel Plan Files (Toes and Basins)	Chart Elements – Channel Plan Files (Color 1)
Channel Plan Files (Centerline)	Chart Elements – Channel Plan Files (Color 2)
Tics	Chart Elements – Grids – XY Grid
Plotting Sheets	Chart Elements – Plotting Sheet Borders
Sweep and Edited Files (Tracklines)	Survey Elements – Vessel – Main - Trackline
Edited Files (Event Text and Circle)	Survey Elements – Events - Events
Target Files (Targets)	Survey Elements – Targets – Not Selected
Target Files (Text)	Survey Elements – Targets – Text (Color Only)

More Information

- “Display Schemes” on page 1-45

EXAMPLE: EXPORTING TO DGN/DXF IN EXPORT

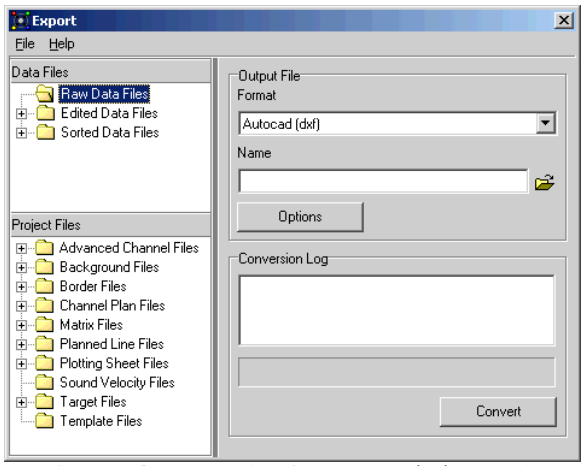
Example

Export Dam7000.lnw and Dam.tgt to a DXF format named Dam7000.dxf. Label your planned lines perpendicular to the survey line with a height of 10 drawing units. Label your targets with label height of 10 and draw two concentric circles around them 5 drawing units apart.

Solution:

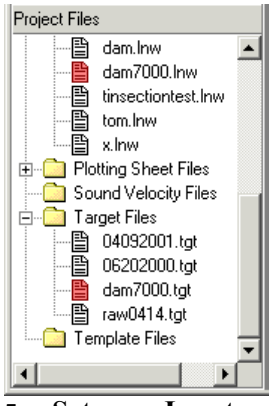
1. **Start the EXPORT program** by selecting FINAL PRODUCTS-EXPORT TO CAD. The Export dialog will appear.

FIGURE 7-25. *Export Dialog*



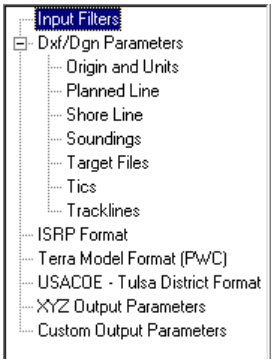
2. **Select Output File format** and choose Autocad (dxf) from the drop-down menu.
3. **Click the File Open icon and name your output file** including the path.
4. **Select the files you want to convert** by enabling dam7000.lnw and the dam.tgt file from the listing.

FIGURE 7-26. *Source Files selected in the Export dialog*



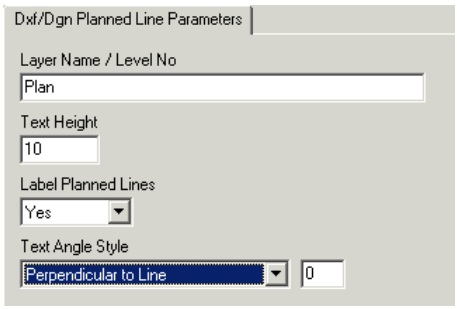
5. **Set your Input and Output Options**. Click [Options] and enter the export settings for each file type you have selected.

FIGURE 7-27. *Tree View listing of Output Settings*



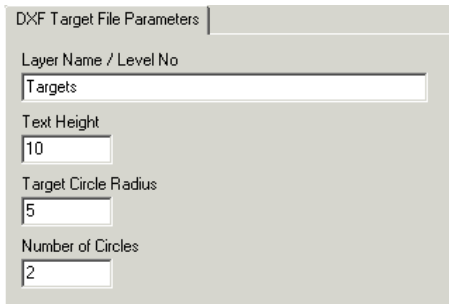
6. **Click Planned Line** and the CAD Planned Line Parameter dialog will appear. Set your layer name. (We'll accept the default Plan.) Set Text Height = 10, Label Planned Lines = True, and Text Angle Style = Perpendicular to Line and click [OK].

FIGURE 7-28. *CAD Planned Line Parameter dialog*



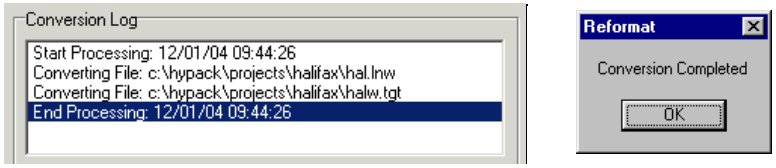
7. **Click Target Files** and the Target File Parameters dialog will appear. Name your layer (or accept the Targets default) and set Text Height = 10, Target Circle Radius = 5 and Number of Circles=2. Click [OK].

FIGURE 7-29. *Target CAD File Parameters Dialog*



8. **Click [Convert].** The Conversion Log dialog will appear to show you the conversion activity.

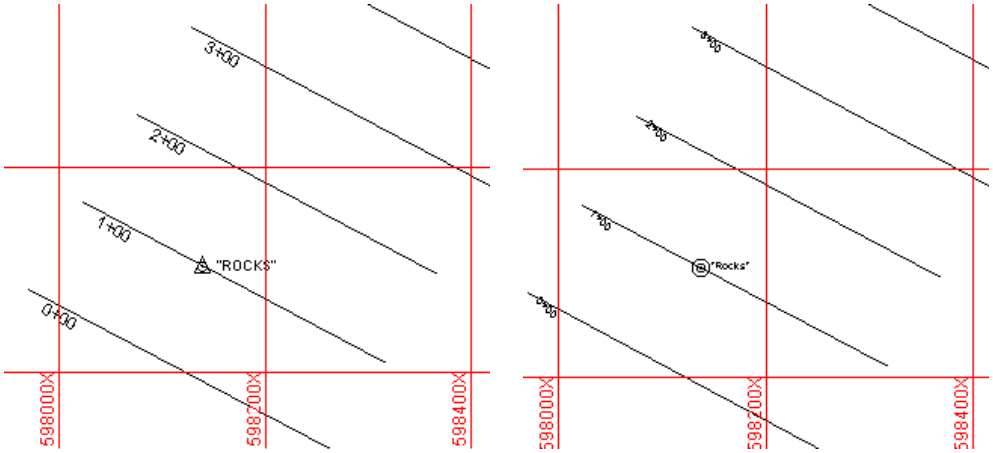
FIGURE 7-30. *Conversion Log*



9. When the conversion is complete, the program will tell you**. Click [OK]**.

You can see the results of your conversion by loading the resultant DXF File as a Background File to your HYPACK® display. Compare this with a display of the original Planned Line and Target Files.

FIGURE 7-31. *Original Line and Target Files (left), Exported DXF Files (right)*



ENC EDITOR

The ENC EDITOR enables you to customize an S57 chart. You can create a new chart of your own that displays as many or as few features as you desire, or you can modify an existing chart by adding, deleting or relocating features. The ENC Editor can be used together with the SURVEY program to do real-time chart verification.

Familiarity with the strict rules and conventions used to structure S57charts is required.

The general procedure is as follows:

1. **Launch the ENC EDITOR** by selecting FINAL PRODUCTS-ENC EDITOR.
2. **Define your geodesy**.
3. **Open a chart.** You can open an existing chart or open a new, blank chart.
4. **Edit chart information**.
5. **Set display options**.
6. **Load files from your project area to guide feature placement.** The ENC EDITOR displays select files to guide you as you create features in your S57 chart. File types supported for this purpose include the following types:
   - DXF
   - DGN
   - Geo-Tif
   - XYZ
   - Target (*.TGT)
7. **Work with the features**.
8. **Validate your chart**. (Optional)
9. **Save your chart** by clicking the save icon on the Charts tab of the Object Manager and naming the new chart. The File Save dialog defaults to the name of the chart you originally loaded. If you have made modifications, you will probably want to modify the name.

More Information

- "S57 Basics" on page 10-113
- "ENC Editor Interface" on page 7-201
- "Geodesy Settings for the ENC Editor" on page 7-204
- "Opening a Chart in ENC Editor" on page 7-205
- "Defining your Chart Information" on page 7-209
- "Displaying your Charts" on page 7-212
- "Working with Features in your Chart" on page 7-225

ENC EDITOR INTERFACE

There are two windows in the ENC EDITOR:

- The **Object Manager** displays textual information about the chart contents.
- The **Editor** window displays the chart.
- The **Clipboard** identifies selected spatial records, and provides tools with which you can find associated features, assign additional features, modify the position or delete the spatial record.

The two displays are synchronized so when a spatial object is selected in the Object Manager, the Editor will automatically display the related information. The Object Manager will not automatically adjust its display according to the selection in the Editor.

Both contain tools that are used together to modify the chart.

Each window can be sized and positioned in whatever configuration you prefer, or you can choose one of the automated configurations from the Editor's Layout menu.

OBJECT MANAGER

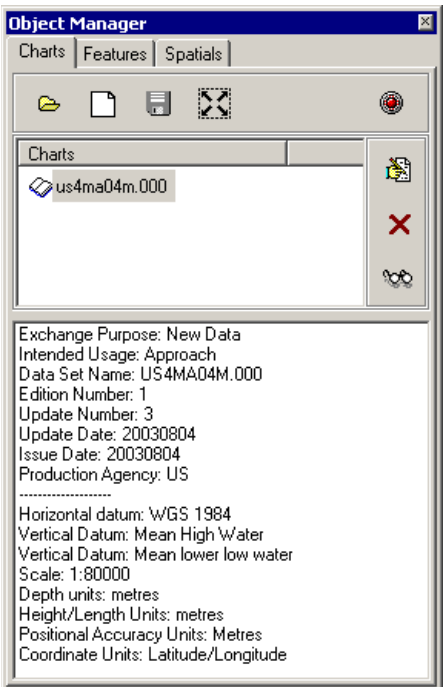
The Object Manager is a three-tabbed display that shows textual information about the features and spatial objects included in your chart.

When you select a Feature in the top portion of the Object Manager, the References tab below lists all associated spatial references, any related master or slave features. If the feature is part of a collection, the name of the collection will be included.

TIP: You can select any of the related master or slave features by double-clicking in the References tab.

When you select a Spatial record in the top portion, the References tab lists all chart features whose position depends on the spatial record. The Information tab shows the number of points used to define the spatial. A point feature should have only one point in its spatial record. Chains will have at least two points and areas at least 3. The start and end points of chains will also be listed.

FIGURE 7-1. *The Object Manager*



To synchronize the Object Manager to your selection in the Editor window:

1. **Select the object in the Editor window.** The object appears in the Clipboard window.
2. **Select the object in the Clipboard window and click [B].** The object will be highlighted in the Spatial tab of the Object Manager.
3. **If you want to identify the features associated with that spatial, select the References tab** in the lower portion of the Object Manager. Master/Slave relationships are labeled as such in the References tab and you can jump from one feature to another by double-clicking on the feature name.
4. **If you want to access the attributes of any associated feature, double-click the feature in the References tab**.

It may be difficult to see the selected feature in the Editor window if you have too much displayed. You can use the display settings to limit what will be drawn to the screen without removing them from your chart. You can further control the number of items displayed through the Spatial and Feature display controls on the Editor's toolbar.

Each tab also includes a toolbar at the top that provides some basic tools to control the objects of its type included in your display. If you are in doubt about the function of the icon, just hold the cursor over it and a label will be displayed.

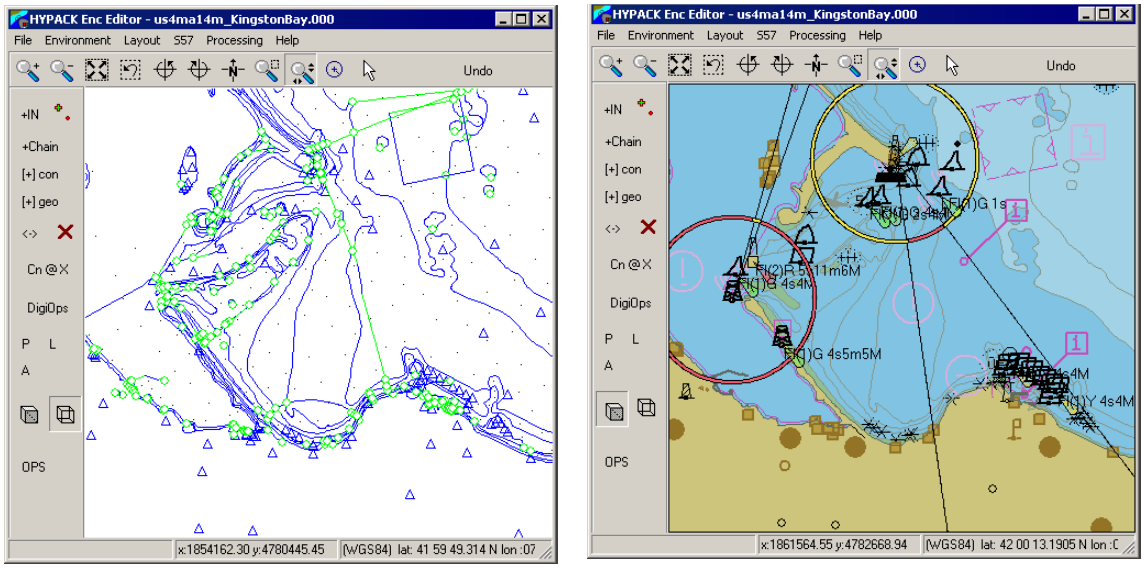
More Information

- “ECDIS Display Options” on page 7-212
- “Spatial or Feature Displays” on page 7-214

THE EDITOR WINDOW IN THE ENC EDITOR

The Editor provides you with an up-to-date visual display of your work. The toolbars enable you to manipulate the chart display and to use the cursor to perform some of the tasks necessary to create a feature in your chart.

FIGURE 7-2. *The Editor Window--Showing Spatials (left) and Features (right)*



The Editor toolbar across the top affects the view of the chart. If you are in doubt about the function of the icon, just hold the cursor over it and a label will appear to help you.

A second toolbar down the left side of the window provides tools for you to directly work with the spatial references in the map area. The small [P], [L] and [A] toggle the display of point, line and area the feature handles. These handles can make selecting a spatial object a bit easier, but they often clutter your chart display.

Icon	Action		Icon	Action
+IN	Add Isolated Node		**scissors**	Delete
+CN	Add Connected Node		**P**	Display Point Handle
+Chain	Add Segment		**L**	Display Line Handle
(arrow)	Selector tool		**A**	Display Area Handle
+ Con	Enables connection		**C**	Display Collection Handle

Icon	Action		Icon	Action
+ Geo	Add Feature to Node		**<->**	Lets you use the cursor to drag nodes of spatial objects to new locations..
Cn@X	Connected node at line intersection			

THE CLIPBOARD WINDOW

The Clipboard displays the spatial type and ID number of a spatial record or the feature type and ID number of a feature record. It also provides tools with which you can work with one or more records.

To add a record to the Clipboard:

- Click on a spatial feature in the Editor.
- Drag either a spatial or feature record from the Object Manager to the Clipboard. Use this method to list multiple objects in the Clipboard.

Once the record is selected in the Clipboard, you can do any of the following:

- **Find the feature associated with the selected spatial record** in the Object Manager. (Click [B].)
- **Assign the position of the spatial record to a feature**.
- **Modify the position of the spatial feature** and its associated features. (Click [E].)

Some functions allow you to select multiple spatials:

- **Delete one or more selected list items from the chart**. (Click [X].)
- **Clear one or more selected list items from the clipboard.** (Click [C].)
- **Clip one feature against a second** using [Clip Ftr] in the Editor.

More Information

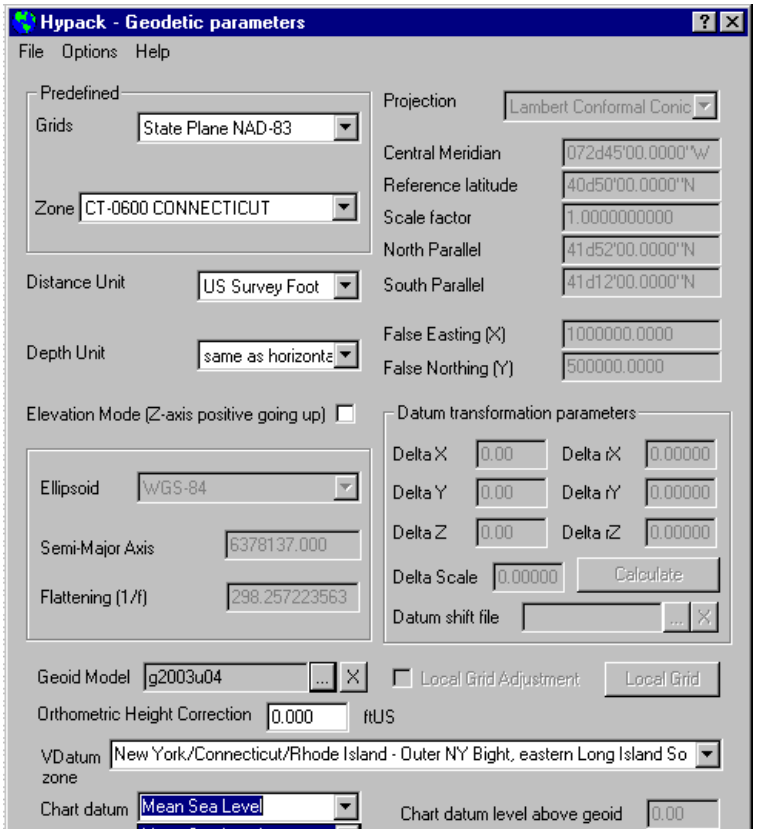
- "Assigning Feature Position" on page 7-231
- "Moving All Features with their Spatial Reference in the ENC Editor" on page 7-235
- "Clipping A Feature Against Another" on page 7-240

GEODESY SETTINGS FOR THE ENC EDITOR

Your chart geodesy is set through the GEODETIC PARAMETERS module.

To view your current settings, select ENVIRONMENT-GEODESY and the Geodetic Parameters dialog will appear.

FIGURE 7-3. *Geodetic Parameters Dialog*



Beware!

BEWARE! *This is for display purposes only.* If any changes to your project geodesy are necessary, exit from ENC EDIT and modify your geodesy through the GEODETIC PARAMETERS program.

OPENING A CHART IN ENC EDITOR

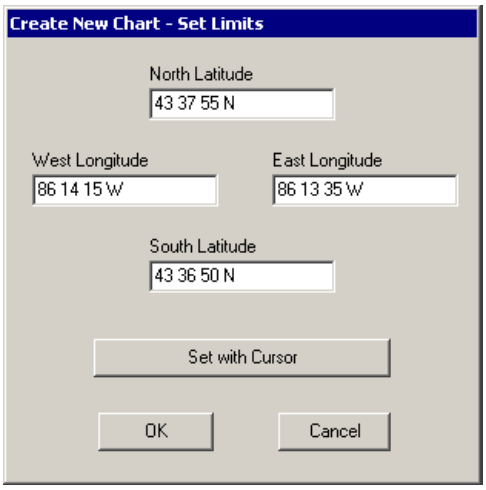
Choose your method to open a chart according to your goal. You can use ENC EDITOR to create a new chart or modify an existing chart.

CREATING A NEW CHART

If you want to create a chart containing only your project data, you must first begin by defining the boundaries of the area described in your chart.

1. **Click the "Create New Chart" icon.** The Create New Chart dialog will appear.

FIGURE 7-4. Defining the Boundaries of your Chart



2. **Define the boundaries of your chart.** Every S57 chart is defined by a pair of latitudinal lines and a pair of longitudinal lines. You can set these values using either of two methods:
   - **Enter the latitudes for the northern and southern edges of your chart and the longitudes for the eastern and western edges.** The ENC EDITOR automatically reads the geodesy settings from your project, so you can enter the local coordinates. You can use decimal degrees, degrees decimal minutes or degrees minutes seconds format.
   - **Click [Set with Cursor] and click in the ENC EDITOR Map display at each corner of the chart to be generated**. A small square will temporarily mark each location

   NOTE: This dialog is available only when you are creating a new chart. You can not alter the boundaries of a chart once they are created.

3. **Click [OK]**.

Now that you have defined the area that your chart will cover, you are ready to enter your chart information and add your chart features.

More Information

- "Defining your Chart Information" on page 7-209
- "Working with Spatial Records" on page 7-217
- "Working with Features in your Chart" on page 7-225
- "Adding DXF or DGN Chart Data to your S57 Charts" on page 7-245
- "Adding XYZ Data to your S57 Chart" on page 7-254

LOADING AN EXISTING S57 CHART

There are two methods to load an existing chart.

Method 1 – Loading a Chart Directly

To load an existing chart, click the "Load Chart" icon. A File Selection dialog will appear for you to select the chart with which you wish to work. Select it and click [OK]. The data will be loaded to the Object Manager and it will be displayed in the Editor.

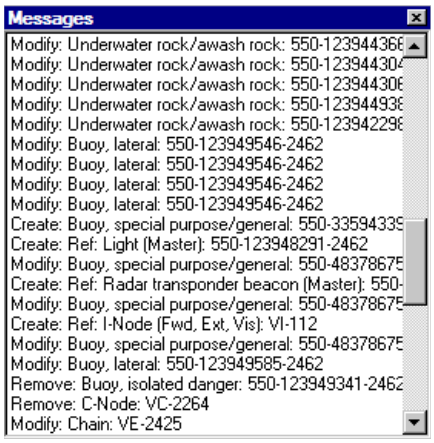
S57 Chart updates may be available for the area where you are working. Updates are named with the same root, but the extension increments with each update. For example, the original 'base' chart might be named 'USRCA11M/US4CA11M.000', and the updates would be 'USRCA11M/US4CA11M.001, USRCA11M/US4CA11M.002…

In this case, you will probably want to include those to display the most current chart information. You can load them:

- **Manually**, taking care to load them in sequence of course, as you did the base chart.
- **Automatically** by loading the base chart then clicking the red button on the Charts tab of the Object Manger.

As each update file is loaded, the Message window will display the changes loaded from each chart.

FIGURE 7-5. *S57 Modifications Listed as Updated Files are Loaded*

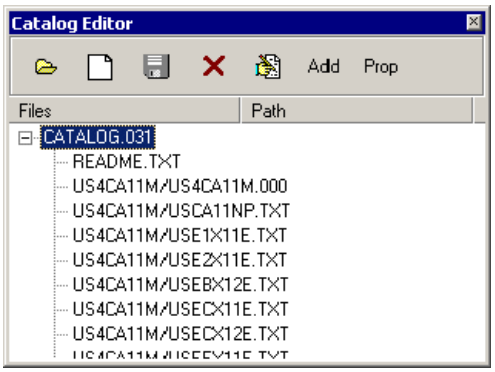


If you are planning to make further modifications, you may want to update your Chart Information at this time.

Method 2— Through a Catalog:

1. **Select S57-CATALOG EDITOR** from the Editor menu. A secondary window, the Catalog Editor, will appear.

FIGURE 7-6. Selecting a Chart from the Catalog Editor



2. **Click the Load Chart icon in the Object Manager and select a catalog** from the File Select dialog. The files included in the selected catalog will be listed in the Catalog Editor.
3. **Select the chart that you wish to edit then click the Edit Chart icon** and the chart will load.

NOTE: *.TIF and *.TXT files are also included in S57 Catalog files. If you select either of these file types instead of a chart file, they will open in a separate window.

When the chart is loaded, the chart name will appear in the left column of the Object Editor and its Chart Information will be displayed. The map will also appear in the Editor window according to the display settings.

LOADING PROJECT FILES TO GUIDE YOUR S57 FEATURE DRAWING

Particularly if you are building a S57 chart of your own, once you define your chart information, accurately placing your chart features may be a little daunting.

The ENC EDITOR displays select files to guide you as you create features in your S57 chart. You can position point, line and area features in your S57 chart on features of interest in the underlying background chart.

File types supported for this purpose include the following types:

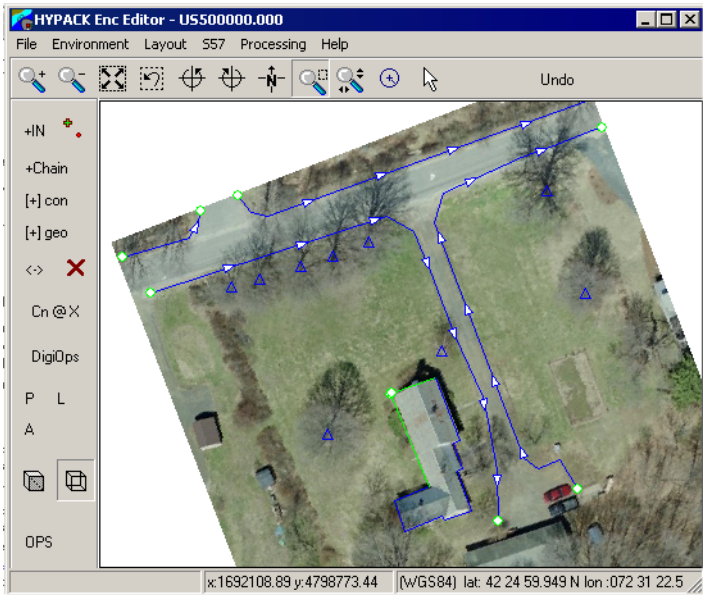
- DXF
- DGN
- Geo-Tif
- XYZ
- Target (*.TGT)

To load these files to the background in the ENC EDITOR:

1. **Select FILE-BACKGROUND CHARTS.** A dialog will appear for you to load and order these files behind the ENC EDITOR display.
2. **Click the File Open icon**,

3. **Set the file type and choose the file** in the File Select dialog,

FIGURE 7-7. *Geo-TIF loaded as a background file in the ENC EDITOR.*



These charts do not become part of your S57 chart in any way. They only display features for you to 'trace' with your S57 features.

The ENC EDITOR can also import features from DXF, DGN, XYZ and target files. This is a process that generates the S57 features corresponding to user-selected features from the imported chart.

More Information

- "Adding DXF or DGN Chart Data to your S57 Charts" on page 7-245
- "Adding XYZ Data to your S57 Chart" on page 7-254

DEFINING YOUR CHART INFORMATION

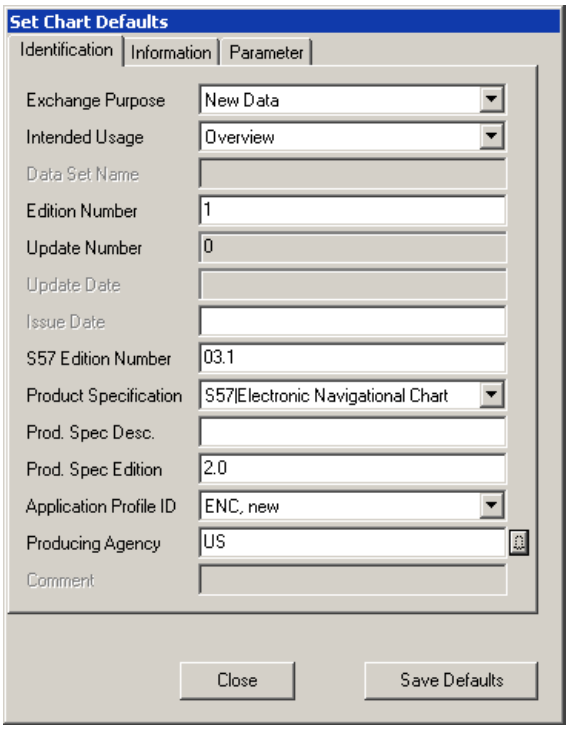
The Chart Information dialog is a 4-tabbed dialog containing information about the chart.

You will notice that fields that have certain required settings have been disabled and already contain the required data. Others display the current information or are blank, but are available to be edited. If there are standard entries for a particular field, a drop-down menu is provided for you to select the appropriate one.

IDENTIFICATION TAB

The Identification Tab includes data about the name and versioning of your chart.

FIGURE 7-8. *The Identification Tab*



If you are creating a new chart, four of the fields default to fixed values which are required to create a new chart with the ENC EDITOR.

- Exchange Purpose
- S57 Edition Number
- Product Specification
- Application Profile ID

In addition, you must at least enter a **Data Set Name** and the **Producing Agency**. The Data Set Name is composed of 8 characters. The first two characters must be the code of the Producing Agency. To find the correct agency code, use the ellipsis button on the Producing Agency line and scan the descriptions in the list.

When the chart is saved, it will automatically receive the *.000 extension of S57 charts.

Typically, you would also enter the **Update Date** and **Issue Date,** which would probably be the same initially.

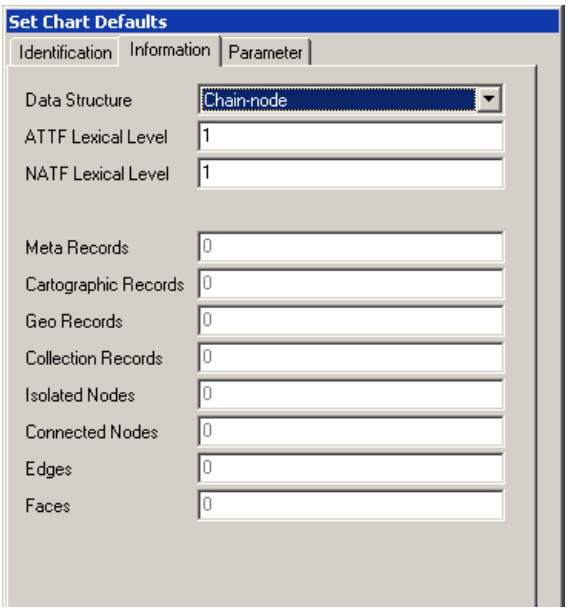
If you are modifying an existing chart, all of the fields are editable. You probably want to change the:

- Exchange Purpose to “Revision”
- Edition Number
- Update Number
- Update Date

INFORMATION TAB

The Information Tab displays information about your chart contents. The only settings that may affect your work are the two Lexical Level items. If you are working in Latin characters, they should be set to "1". If you are working in Asian characters, use "2".

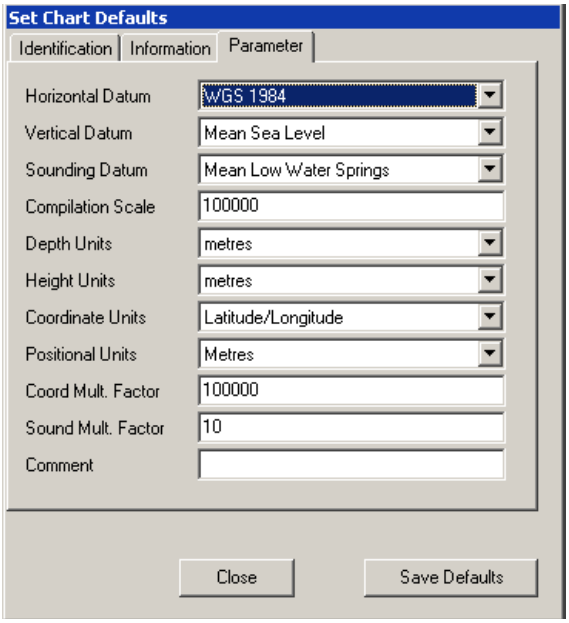
FIGURE 7-9. *The Information Tab*



PARAMETER TAB

The data comes from your geodetic parameters. You can not edit them in this dialog. If you need to change them, exit the ENC EDITOR, use the GEODETIC PARAMETERS program to make the changes, then reopen the ENC EDITOR.

FIGURE 7-10. *The Parameter Tab*



DISPLAYING YOUR CHARTS

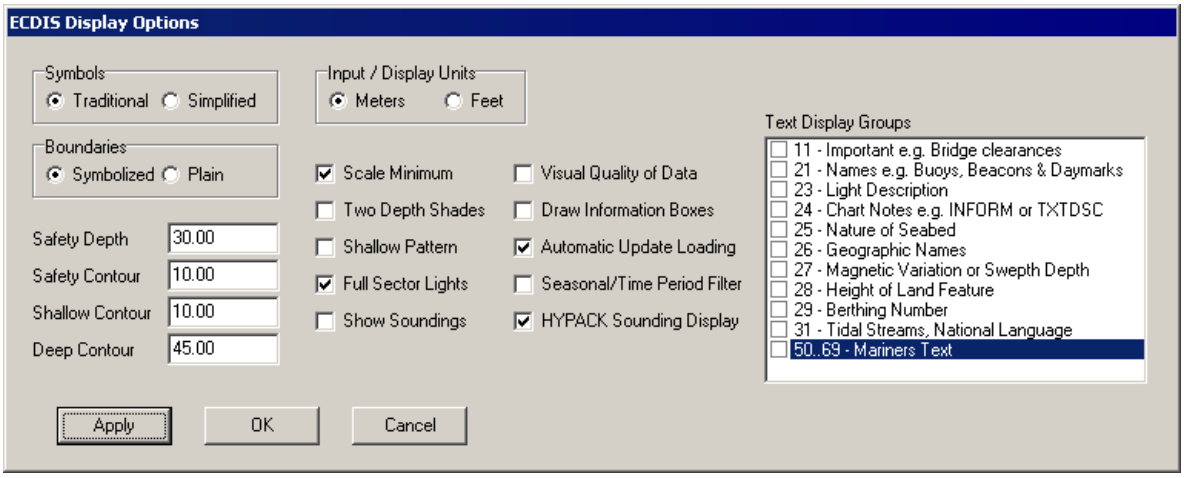
The ENC EDITOR provides a wide selection of options with which you can customize your chart display:

- ECDIS display options affect the chart features themselves.
- Spatial or Feature display options toggle the display of the spatial and feature chart information.
- Depth options for removing or minimizing the clutter of excessive sounding data.

ECDIS DISPLAY OPTIONS

In the Editor window, select S57-DISPLAY OPTIONS and the ECDIS Display Options dialog will appear for you to choose how your chart will be presented in the Editor display.

FIGURE 7-11. *S57 Options Dialog*



Symbols: Choose between Traditional and Simplified.

Boundaries: Choose to have them marked with symbols (Symbolized) or as plain lines (Plain).

Safety Depth displays depth labels in different colors above and below this depth.

Safety Contour, Shallow Contour and **Deep Contour** define different depth ranges which will be displayed with backgrounds of different shades of blue. Note: This option is overridden by the Two Depth Shades option.

Input/Display Units: The units of measure in which your depths will be displayed. It is also the unit in which you will work while in the ENC EDITOR. (You will enter chart soundings and all measurements in the selected units.)

NOTE: In the ENC EDITOR, sounding files imported to your chart are assumed to be in the units defined in your geodetic parameters. They are converted to the units indicated in your chart information and displayed according the units set in the S57 display options.

Scale Minimum displays different map features and symbols at varying zoom scales according to S57 standards. This option prevents your Map window from becoming overly cluttered. If this option is clear, everything will be displayed regardless of the zoom scale.

Two Depth Shades uses only two shades to display depths greater than and less than the Safety Contour.

Shallow Pattern draws a pattern in the areas of the map where the depth is shoaler than the safety contour.

Full Sector Lights includes data regarding direction and color of lights. If this is off, you will see only the position of the light source.

Show Soundings toggles the display of chart soundings.

Visual Quality of Data: S57 charts include markings that indicate whether the chart has been tested for accuracy and, if so, how accurate it is. Check this option to clear this 'clutter' from your display.

Draw Information Boxes: Draws S57 markers at all points of interest. Clearing this option will provide a less cluttered display.

Automatic Update Loading: When you load a base chart (typically *.000) and there are update charts (typically *.001, *.002…) in the same folder, checking this option loads all related chart information to provide the most updated display.

Seasonal/Time Period Filter: Object attributes may specify time ranges when they would be most applicable to display. Check this option to display only objects whose attributes match the current time.

HYPACK® Soundings Display: When 'Show Soundings' is checked, this option toggles between ECDIS display and HYPACK® display options.

Text Display Groups: Charts can get cluttered with excessive text. Select only those text features you want to see in your chart display.

FIGURE 7-12.

More Information

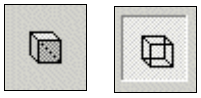
- "Entering your Geodetic Parameters" on page 2-44

SPATIAL OR FEATURE DISPLAYS

At times, it will be helpful if the Editor's map view displays only the spatial references or only the features. Then, of course, there are bound to be times when you need the spatial references overlaid on the features.

Two icons on Editor window's toolbar provide all of this functionality for you.

FIGURE 7-13. *Display Chart Icon (left) and Display Geometry Icon (right)*



The *Display* Chart icon toggles the display of the feature objects, while the *Display Geometry* icon controls the spatial reference display. You can set one on and one off or both on, depending on your needs at any time. (Of course, you can also set them both off, but an empty screen is not very useful!)

In addition to turning spatial and feature displays on and off, you can include or exclude certain objects in your chart display by clicking [OPS].

- **Show IN Spatial** toggles isolated node displays on and off

- **Show 3D Spatial** toggles 3-dimensional spatial information (like depths) on and off.
- **SOE (Skin of the Earth) Only Feature** toggles features that are not Skin of the Earth features on and off. SOE features include geological features such as land and water. This option overrides other options that might be selected to display but are not Skin of the Earth

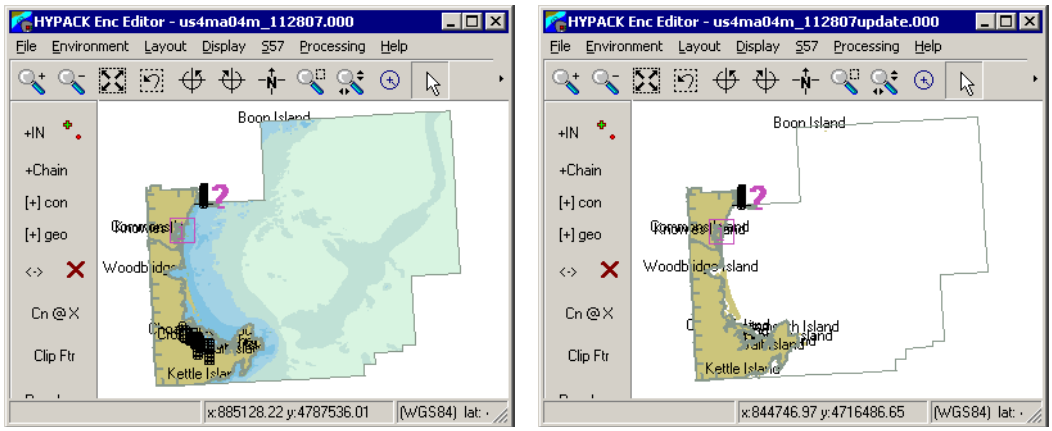
DEPTH DISPLAY OPTIONS

The Processing menu includes options for removing or minimizing the clutter of excessive sounding data.

Combine Soundings assigns all soundings to a specialized type of spatial object which lists the positions for all soundings currently in the chart. This reduces the amount of memory required to store and display the information. If you import new soundings from subsequent surveys, they will remain separate from the grouped soundings unless you select this option again.

Remove Soundings, Depth Areas and Contours omits the chart's depth data from the display.

FIGURE 7-14. *Removing Hydrographic Data Before (left) and After (right)*



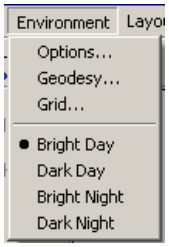
PREVIEWING THE S57 DISPLAY LIBRARY

The ENC EDITOR displays your charts based on a standard scheme of colors and symbols.

To preview how features are drawn to a chart without actually adding the feature to a chart, select S57-SCHEMA. In the Display Commands tab, you can select any chart feature in the library and view a sample of the corresponding feature.

ADJUSTING THE DISPLAY FOR LIGHTING CONDITIONS

If you work in varying lighting situations, you can adjust the brightness of the chart display in the Editor window to optimize your viewing.

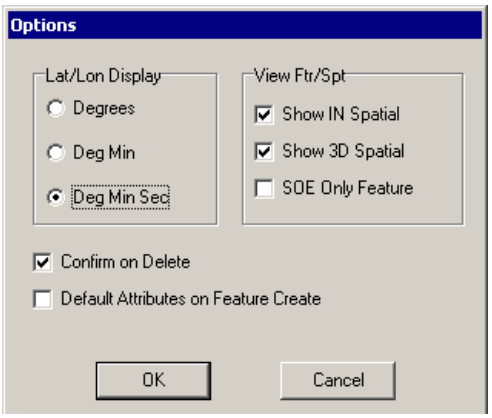


In the Editor menu, select ENVIRONMENT then any of the lighting choices from “Day Bright” to “Night”. The chart will darken or brighten accordingly. This does not affect the window elements of the S57 Editor Windows.

CURSOR AND DELETE OPTIONS IN THE ENC EDITOR

Select ENVIRONMENT-OPTIONS to set options for the cursor display and delete confirmation.

FIGURE 7-15. *Environment Options Dialog*



Cursor Position Display Options: The status bar in the Editor shows the position of your cursor in the chart. Select ENVIRONMENT-OPTIONS and select the format of this display. It can be X,Y or Lat./Lon. (3 configurations).

Confirmation on Delete tells the program to ask you for confirmation each time you delete an object in your chart.

Default Attributes on Feature Create is in development. The intent is that any feature with a ‘required’ attribute tag, but without a defined attribute, will be assigned the default ‘missing attribute’. In this way, the chart will pass validation, though the attribute has not been specified.

FEATURE TYPES IN S57 CHARTS

There are four types of chart features:

- **Point features** can be positioned using a single point (usually an isolated node). A rock, a buoy, a light or a wreck may all be adequately positioned in this way.
- **Line features** require 2 or more connected points forming a line (not a closed polygon) to describe them. Pipelines, roadways and shorelines are all line features. This type of feature will be described by a chain (or a series of chains each) terminated by a connected node.
- **Area features** are described by closed polygons. These areas may be defined by one or more chains. The simplest area is described by a chain that begins and ends at the same connected node. The area described is always to the right of the chain.
- **Collections** feature that references other features, but contains no spatial information.

Each feature is positioned in your chart by associating it with a spatial record.

Both features and spatial records have properties defined in the S57 chart. They can be displayed by clicking the Feature Information icon in the Features and Spatials tabs.

WORKING WITH SPATIAL RECORDS

Some situations require you to create a new spatial reference without a feature assigned to it yet. For example, if you have multiple features associated to one spatial reference, then decide to relocate one or some (but not all) of them.

Let's say the Coast Guard Station has been out on a rocky point by the lighthouse with an isolated beacon, but now the Coast Guard is moving down the beach. In this case, you would create a spatial record at the new location (where the Coast Guard Station is), then assign the feature (the Coast Guard Station) to the new spatial record. That leaves the beacon at the lighthouse which has not moved.

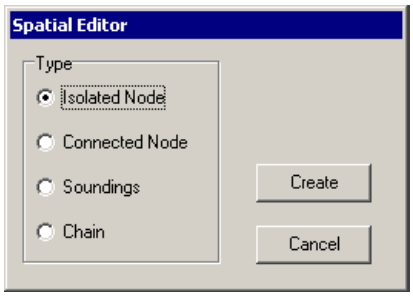
There are two methods to do this:

- Using the Spatial Editor
- Using your Cursor

CREATING SPATIAL RECORDS THROUGH THE SPATIAL EDITOR

1. In the Object Manager-Spatials tab, click the **Add Spatial icon**. The Spatial Editor dialog will appear.

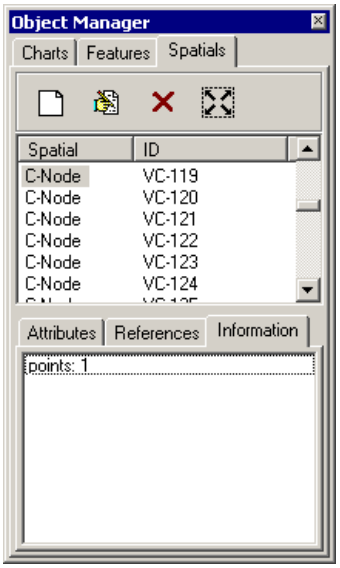
FIGURE 7-16. *Spatial Editor*



2. **Select the type of spatial that you want to create and click [Create].** In this example, we will create an Isolated Node for the new Coast Guard Station. (The procedure for other feature types is basically the same.) The spatial record will appear in the Object Manager Spatials list. Since, this time, we have only created a node, there is only one point listed in the spatial information. Chains and areas show no points; you will have to define them in the Point Editor.

NOTE: There are no references listed because this spatial reference does not yet have any features associated with it.

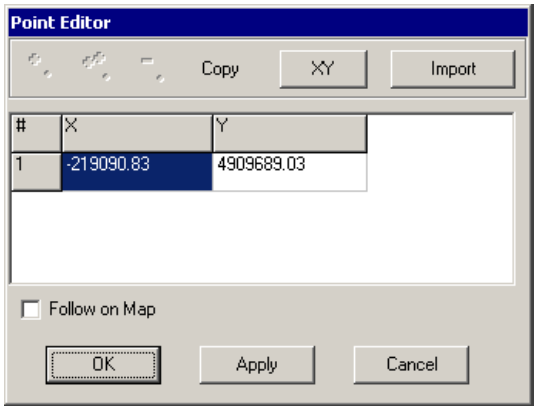
FIGURE 7-17. *The New Spatial Object is listed in the Object Manager.*



3. **Double-click on the points information** in the Information Tab. The Point Editor will appear.

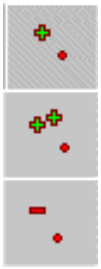
The *Follow on Map* check box will highlight the spatial selected on the map in the Editor, regardless of your zoom scale. This will be particularly handy when you are defining areas.

FIGURE 7-18. Point Editor



4. **Enter the correct coordinates for your spatial record** and click [OK].
   - **If you chose "Isolated Node" or "Connected Node**" in step 2, default point coordinates will appear. Modify them for your purpose and click [OK].
   - **If you chose "Soundings" or "Chain",** the icons will be enabled for you to create the required number of points and enter the coordinates.

Add Point adds a row to the bottom of the spreadsheet.



Insert Point adds a blank row above the currently selected row.

Delete Point removes the current row from the spreadsheet.

Creating a chain or area requires a few more steps to create and attach the mandatory connected nodes as follows:

5. **Click [+CN]** and create 2 Connected Nodes for the ends of a Chain (or 1 for a simple Area).
6. **Click [+con]** then click the connected node and the chain end. A connecting line will be created. Repeat to connect the other end of the chain to the other connected node (or, in the case of a simple area, to the same connected node).

A new spatial object will appear red because it is currently selected. When it is no longer selected, it will be blue.

More Information

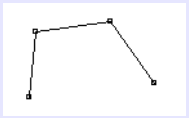
- "Assigning Feature Position" on page 7-231

CREATING SPATIAL RECORDS USING THE CURSOR

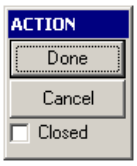
1. **Load the chart or chart area.** - This method is most useful if you do not have a list of specific coordinates that define the positions of the

nodes. (It is difficult to be that accurate with the cursor, though you can make an approximation then edit the coordinates later.)

2. **In the Editor, click the add button for** the **type of spatial object you want to create**.

Button	Spatial Object	Chart Display Symbol
[+IN]	Isolate Node	Triangle △
[+Chain]	Chain and Area	Small squares connected with straight lines. 

3. **Click the location or locations of the feature** on your chart and the corresponding feature will appear.
   - **For Point Objects**, a point spatial is generated at each location you click in the chart until you click the Add button again.
   - **For Chains and Areas**, an additional control dialog will appear. Click in the chart to define all of the nodes in the chain then click [Done]. If the closed option is checked, the ENC EDITOR will create a closed polygon by adding a segment and a connected node between the first and last nodes If the Closed option is clear, the chain will be created as a polyline with connected nodes at each end.



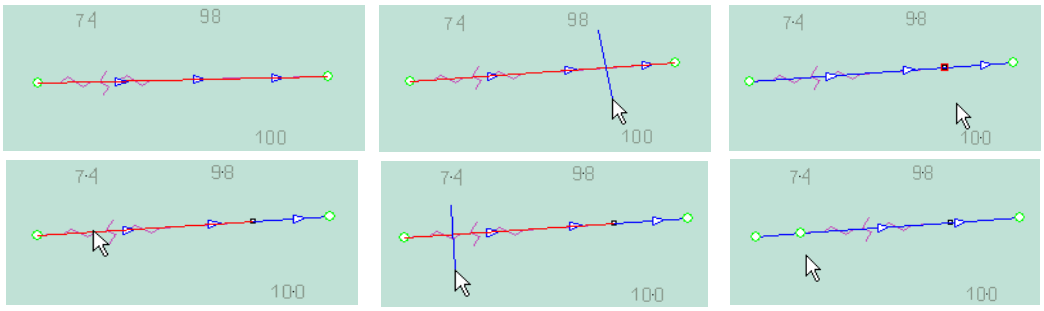
4. **When you are finished, change back to the Selections Tool** by clicking the arrow on the toolbar. If you fail to do this, you are likely to create some spatial references that were not intended.

MODIFYING CHAINS USING CURSOR TOOLS

After a chain or area spatial has been defined, you may want to adjust the shape in a way that requires additional points to define the chain. Using cursor tools, you can insert either a simple point or a connected node into an existing chain.

1. **Use the selector tool to select the chain or chain segment.**
2. **Click the tool for the type of spatial you want to insert**.
   - For a simple point, click [xPT].
   - For a connected node, click [xCN].
3. **Using your cursor, drag a line across the chain at the position where you want to insert the point.** When you release your mouse button, the point or connected node will be inserted.

FIGURE 7-19. *Inserting a Point (top row) and Connected Node (bottom row)*



CHAIN DIRECTION AFFECTS THE AREA DESCRIBED

When you are describing areas, S57 rules require that the area being described always lie on the right of the line. The questions now become, "Which side is the right side?" and "Have I described an island (the interior of the polygon) or a hole (the exterior of the polygon)?".

When you have assigned a chain (or series of chains) to an area feature, they are listed in the references list of the Features Tab. You will see, as part of that listing, three properties of the chain listed in parentheses. The first describes the direction of the chain. There are two choices:

- Forward (Fwd) means that the chain goes in the direction it was created with a connected node on each end. (Connected Node, #1, #2,…#n, Connected Node)
- Reverse (Rvs) means that the chain goes from last to first node created with a connected node on each end. (Connected Node, #n,…#2,#1, Connected Node)

DETERMINING CHAIN DIRECTION

At this point in the process, we are referring to the direction of the spatial object. Just click on the spatial object displayed in the map and the chain will highlight with arrows indicating its direction. The Selections window will also appear showing the name of the chain you have chosen.

This may be different than the direction of the chain in one or more of its assigned features. For example, a chain may be created in the clockwise direction to define an island. The same chain may be assigned to the surrounding water depth area which would require that its direction be reversed.

FIGURE 7-20. *Clockwise defines the coastline*

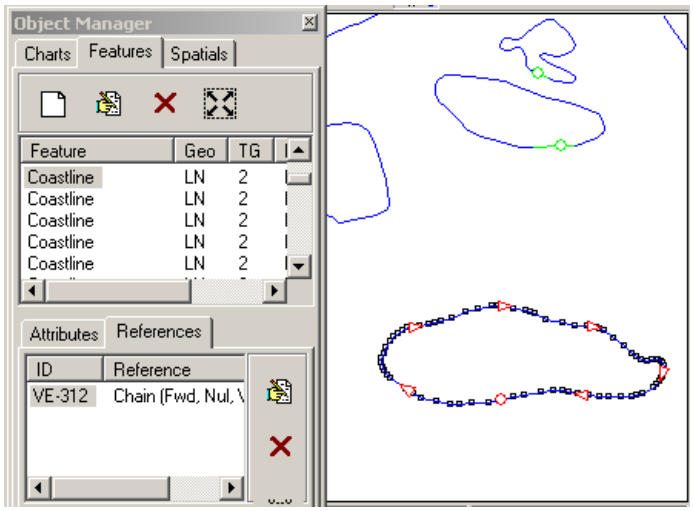
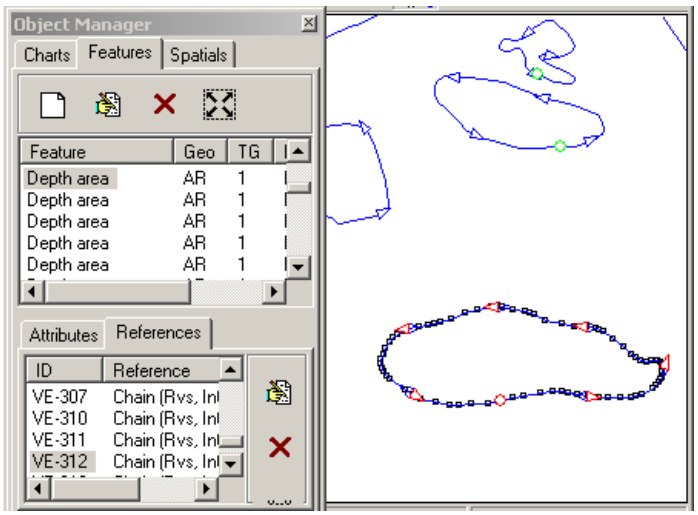


FIGURE 7-21. *Counter-clockwise defines the depth area*



NOTE: Take care that you select the object only in the map or Selections window (forward direction). If you have also selected one of the features to which it is assigned where its direction is reversed, you will see arrows going in both directions.

Determining Left and Right of the Chain

Once you have the direction of the chain, determining the left and right just needs a little imagination. Imagine that you are standing on the first point of the chain (#1) and looking toward the second point. The area that you have described with that chain is to the right. If this is not what you intended, reverse the direction of the line.

Modifying Chain Direction

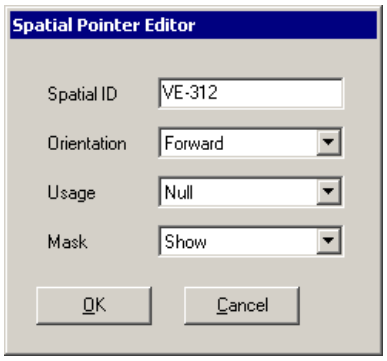
There are two procedures for changing the direction of the chain.

- **Using the Spatial Point Editor:** This process is most useful if you have only a few chains and all you have to do is change the direction of one or two.
- **Using the Chain Reference Editor.** This method is more useful when an area is described by multiple chains. It allows you to see all of the chains, their order and how they relate to each other. In addition to enabling you to reverse chain direction of more than one chain, the dialog provides tools for you to remove or re-order them as well.

To Modify the Chain Direction with the Spatial Point Editor:

1. In the Features Tab, **select the chain in the references list**.
2. **Click the Edit Reference icon** and the Spatial Point Editor will appear.

FIGURE 7-22. *Spatial Point Editor*



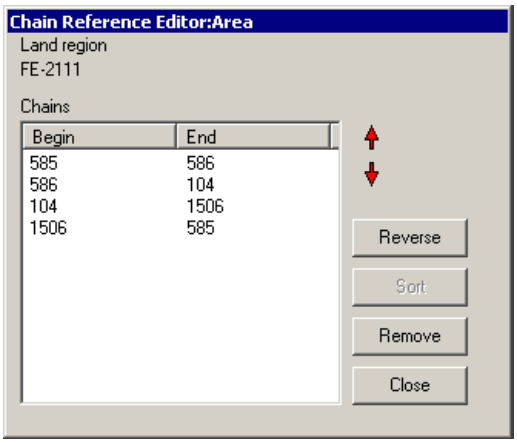
3. **Select the correct orientation** using the drop-down list and click [OK].

To Modify Chain Direction in the Chain Reference Editor:

1. **In the Features Tab, click the Open Chain Reference Tool icon.** The Chain Reference Editor will appear. It displays the ID numbers of the connecting node pairs that link all of the chains that describe the line or area.

2. **Check for two conditions.**
   - The last ID of one chain should be the first ID of the next chain following it in the list.
   - If you have defined an area, the last ID of the last node should match the first ID of the first node to describe a closed polygon.

FIGURE 7-23. *Chain Reference Editor*



3. **If either of these conditions is not met, modify your list** to meet them.
   - **To re-order the chains** by select them, one at a time, and shift them up or down using the arrow buttons.
   - **To swap the begin and end points**, select the chain and click [Reverse].
4. **When the two criteria are met, click [Close]** to return to the Object Manager.

REMOVING SPATIAL RECORDS

An '**Orphan**' is a spatial feature that has no chart feature associated with it. If a spatial does not describe a chart feature or any part of a chart feature, it is likely not contributing anything to the chart in its current state.

You can manually delete individual spatial records or, if your chart is in a finished state, with all chart features created and assigned to their spatial references, you can quickly remove all orphaned spatial features.

Beware!

BEWARE! *Before you delete a spatial record,* always check the list of features associated with it to be sure you are not deleting something important.

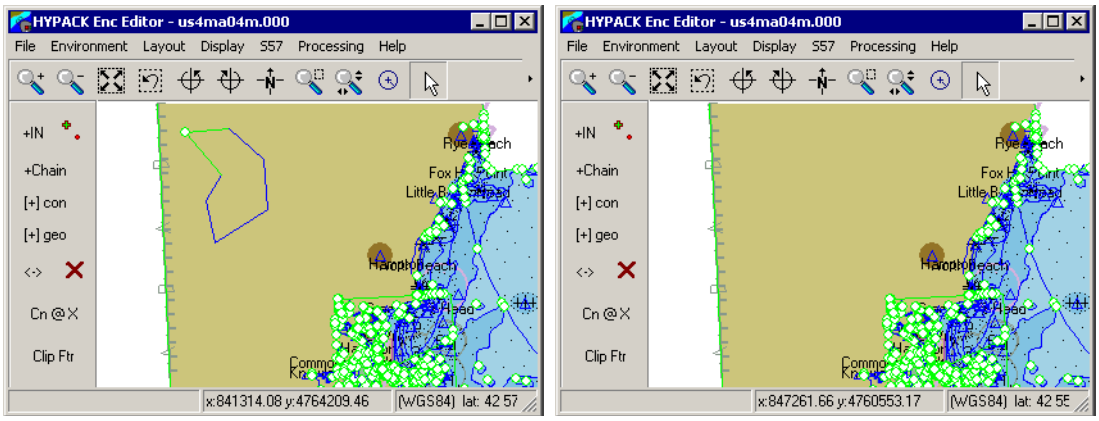
To manually delete a spatial record:

1. **Select the spatial in the Editor window.** The selected spatial appears in the Clipboard window.
2. **Confirm the spatial has no associated feature that you need**.
3. **Click the red [X].**

To automatically remove all orphans:

Select PROCESSING-REMOVE ORPHANS. The ENC EDITOR checks each spatial for an associated chart feature and removes all orphans from your chart.

FIGURE 7-24. Removing Orphaned Spatial Features--Before (left) and After (right)



WORKING WITH FEATURES IN YOUR CHART

Whether you are creating a new chart and have a blank area within your boundaries in front of you, or you are modifying an existing chart, the procedures for adding, moving or deleting chart features are generally the same.

Point Features are the simplest type, then the Line and Area Features are only a bit more complex.

ADDING FEATURES IN THE ENC EDITOR

All feature types are added in, generally, the same way. The following sections will provide detailed information on how to:

1. **Create a feature.**
2. **Assign attributes to the feature.**
3. **Assign a location to the feature.**

ADDING POINT FEATURES IN THE ENC EDITOR

Point features are unique in that, you can create the feature and link it to an isolated node all in one process. Of course, you can also create them separately then link them together.

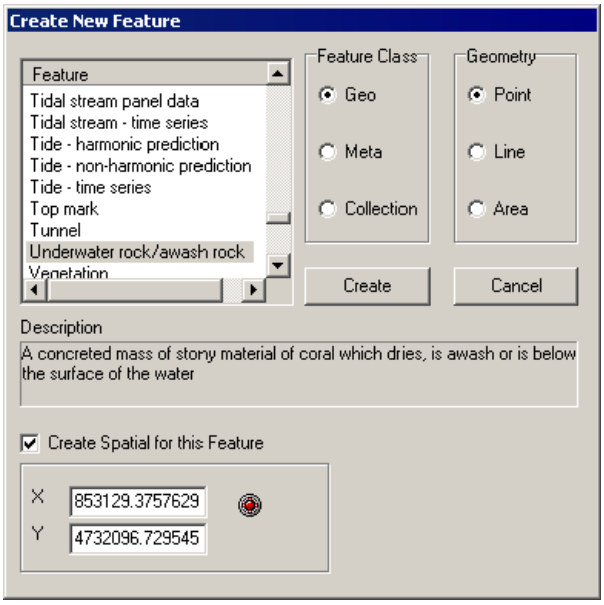
Creating a Point Feature with Spatial Record

If you are creating a feature in a location where no spatial record exists, you can create both at once by using the following method.

1. In the Chart tab of the Object Editor, **select the chart to which you want to add the feature**.
2. **Capture the location where you want to place the feature.** Double-click in the Editor window chart display at the location where you will place the object. The ENC EDITOR will capture the cursor position.
3. **Add the feature.**

a. In the Object Manager, **select the Feature tab and click the Add Feature icon.** The Create New Feature dialog will appear for you to describe your feature.

FIGURE 7-25. *Create New Feature Dialog with Spatial Record*



b. **Select the feature class and geometry from the lists.** Since you are creating a point feature, select 'Geo' and 'Point'. When you select the geometry, the list of features will include only those that can be point features.

c. **Make a selection from the Features list**. A generic feature description appears.

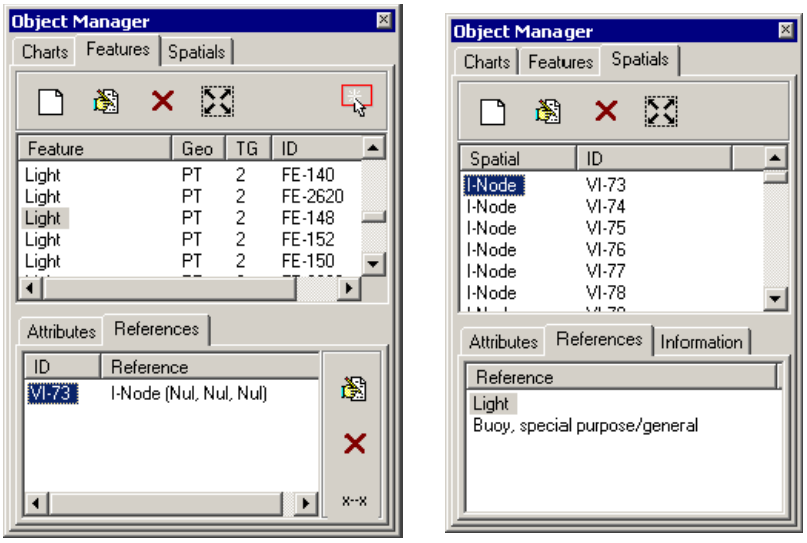
d. **Enter the captured position.**

   i. Check the 'Create Spatial for this Feature' box.

   ii. Click the red button icon. The ENC EDITOR calculates the local X Y and enters the captured position for you.

e. **Click [Create].** The dialog will close and the new feature will be drawn in the Editor Window and added to the Features and Spatials lists in the Object Manager.

FIGURE 7-26. *Feature listed in the Object Manager-- Features Tab (left), Spatial Tab (right)*



Creating a point feature without spatial record:

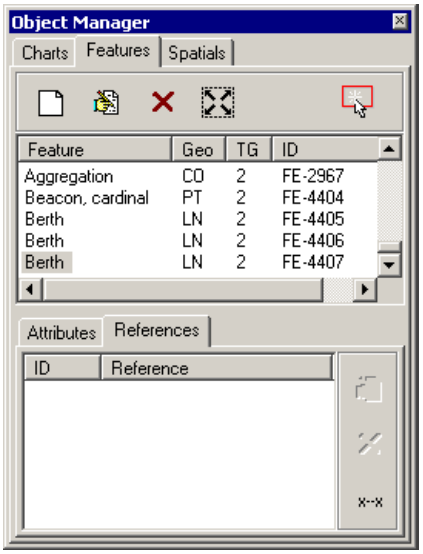
You may have more than one feature located in the same place. After you create the first feature with its spatial record, additional features are added at the same location by creating them without spatial records, then assigning them to the existing spatial record.

For example, this would occur if you have submerged rocks marked by a buoy. In this case you might create your rocks with a spatial record (as described above), then create the buoy and assign it to the same spatial record.

1. **Select the Feature tab and click the Add Feature icon.** The Create New Feature dialog will appear for you to describe your feature.
2. **Leave the Spatial Data area blank** in the Create New Feature dialog.
3. **Assign your feature to your spatial record.**

NOTE: Until this feature is assigned to a spatial record , it is not listed in the Spatials tab nor are there any references in the Features tab.

FIGURE 7-27. *Feature listed in the Object Manager-- Features Tab*



More Information

- "Assigning Feature Position" on page 7-231

Adding Line or Area Features in the ENC Editor

Now that you are experts at manipulating points, the procedures for working with chains and areas follow about the same pattern.

Chains differ from Points as follows:

- You cannot create them with spatial information in one process.
- Chains must be terminated by connected nodes.
  - **For a Line Feature**, you would add a connected node to each end.
  - **For an Area,** create a chain or a series of chains and link the ends with a connected node to form a polygon.

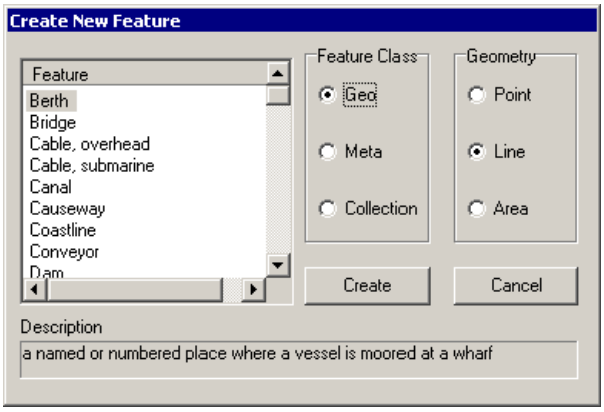
A Line or Area Feature is created in the same way as a Point Feature that is created initially without spatial data. The sequence of events is always:

1. **Create a Line or Area Feature**.
2. **Create a Chain Spatial Object.**
3. **Link the Line or Area Feature to the spatial record** in the same manner as Point Features are linked to their spatial records.

In the following example, we are creating a berth feature as a Line Feature in order to compare creating a Line Feature with creating a Point Feature. A berth feature could also be an Area Feature, since it can define an enclosed space so we will also note the minor differences in the process to create the Area Feature instead.

1. **In the Object Manager, select the Feature tab and click the Add Feature icon.** The Create New Feature dialog will appear for you to describe your feature and click [OK].

FIGURE 7-28. Create new Feature Dialog with Spatial Record

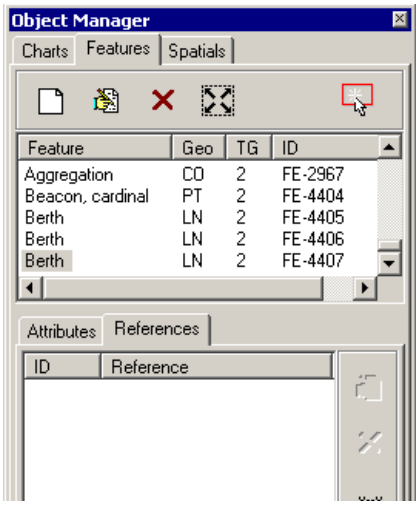


2. **Under 'Geometry', select 'Line' (or 'Area')** and the list of features will include only those that can be Line Features. (If you wanted to create an Area Feature, the same would apply if you chose the "Area" geometry.)
3. **Select the feature class, 'Berth', from the list and click [Create]**.

NOTE: The Spatial fields are only displayed in the Create New Feature dialog when you are creating a Point Feature. Spatial information for line and area features must be created and assigned separately.

4. **Click [Create].** The dialog will close and the new feature will be added to the Features list in the Object Manager. It cannot be drawn to the map yet because it has no position information (spatial record) assigned to it.

FIGURE 7-29. Feature listed in the Object Manager-- Features Tab



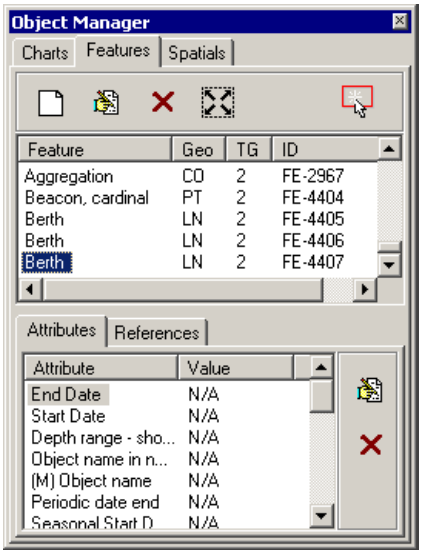
More Information

- "Assigning Feature Position" on page 7-231"

ASSIGNING FEATURE ATTRIBUTES

When a feature is created, regardless of whether it is Point, Line or Area, the ENC EDITOR has only a minimal amount of information about it. Each feature type has a series of attributes that further describe it. Attributes that *may* be applicable to your feature are listed under Attributes in the Features tab of the Object Manager.

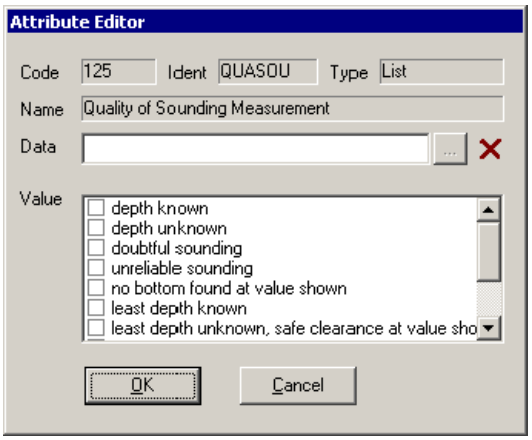
FIGURE 7-30. *Sample Object Manager listing Objects and Attributes*



When a new feature is first created, each attribute is followed by "N/A", which indicates the attribute has not been assigned to the feature. You need only apply the attribute (or attributes) pertinent to your feature. All are optional.

1. **Select the attribute that you want to apply in the list and click the Edit Attribute icon** (or double-click the attribute). An Attribute Editor dialog will appear with options specific to that attribute.

FIGURE 7-31. *Sample Attribute Editor*



2. **Describe the attributes**. Often this is as easy as choosing from a list of standard options provided in the dialog.

3. **Click [OK]** to apply the attribute and return to the Object Manager. The selected description will replace the "N/A" next to that attribute type in the Attributes list.

Removing an attribute: Select the attribute under Attributes in the Features tab of the Object Manager and click the "Remove Attribute" icon. The description will return to "N/A".

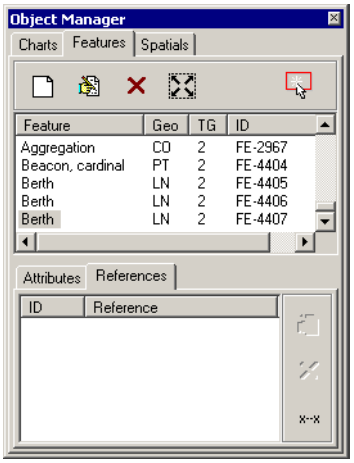
Modifying an attribute: Select the attribute under Attributes in the Features tab of the Object Manager and click the Edit Attribute icon again. Change the setting in the Attribute Editor and click [OK].

ASSIGNING FEATURE POSITION

If you have created a feature without spatial record, the chart still needs to know where the feature is located.

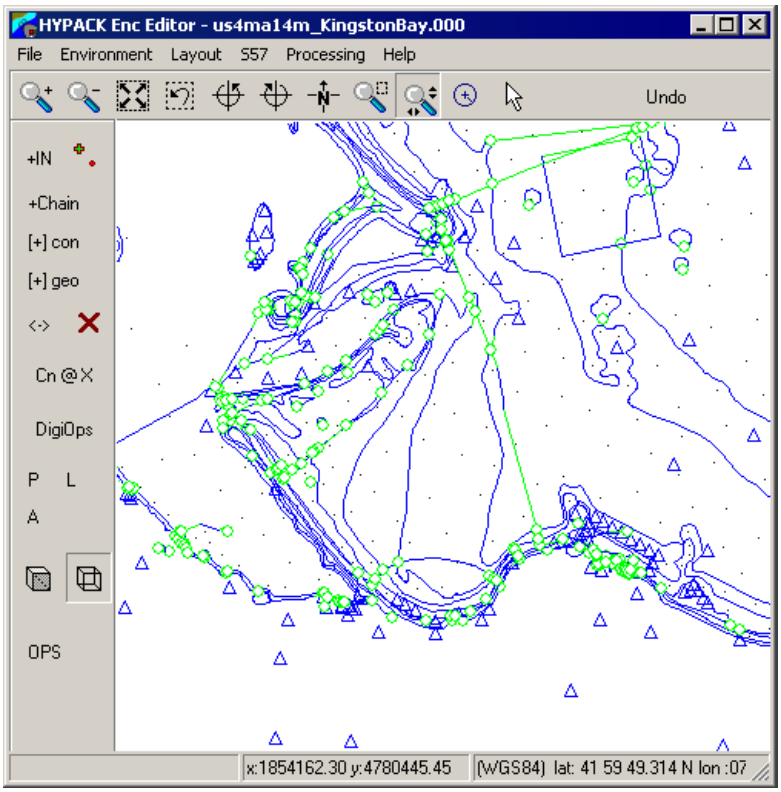
1. **If a spatial record does not exist at the correct location, create one.**
2. **Select your feature in the Features tab of the Object Manager**. Notice the References area is blank when there are no spatial records assigned.

FIGURE 7-32. *Features with no spatial records show no references.*



3. **Set the Editor window to show spatial records** only by clicking the *Display Geometry* button.

FIGURE 7-33. *Selecting the Spatial Record in the Editor*



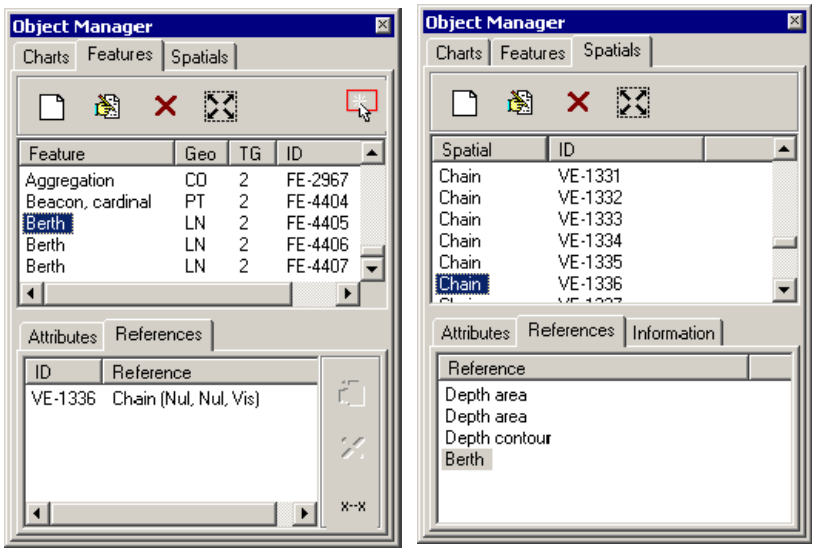
4. **Click on the Selector Tool icon in the toolbar then use the cursor to click on the spatial object in the map window**. The Clipboard window will appear and display a 2-letter code to indicate the type of spatial and an ID number that is unique to the selected object.

The Clipboard window is used, in this case, to record your spatial information so that you can transfer it to the Object Manager.

a. **Check to be sure the Object Manager Features Tab is still on the feature** you have created for that location.

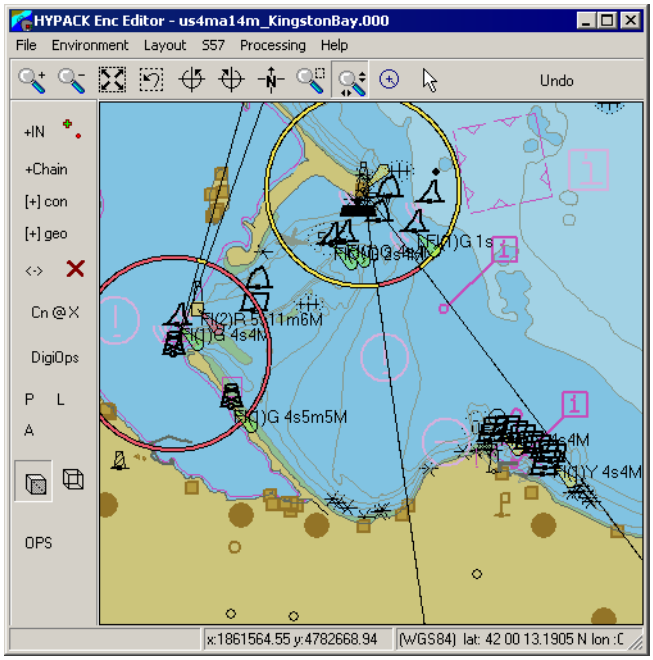
b. **Drag the spatial object from the Clipboard window to the References area in the Object Manager.** The spatial information should now be written in the References Area of the Object Manager. Also, if you change to the Spatials Tab, the feature you have created should be displayed in the reference area for the spatial feature in the Spatials list.

FIGURE 7-34. Feature listed in the Object Manager-- Features Tab (left), Spatial Tab (right)



c. **In the Editor window, click the Show Features icon** and the appropriate symbols, if there are any, will be displayed.

FIGURE 7-35. Features show symbols in chart view



More Information

- "Working with Spatial Records" on page 7-217

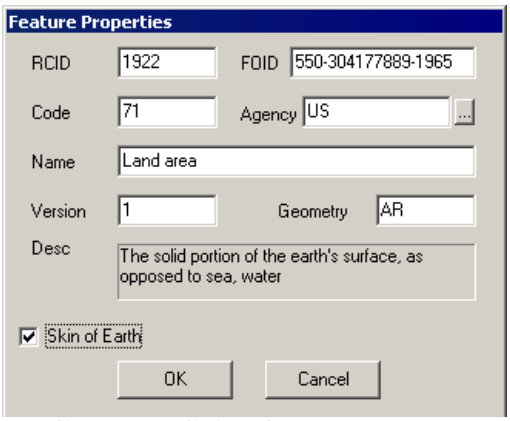
Skin of the Earth Features

The Skin of the Earth display option displays only Skin of the Earth features. Typically, these features are bodies of land and water.

To make your feature a Skin of the Earth feature:

1. **Select the feature** in the Features tab of the Object Manager.
   a. Select the feature in the Editor window. Its name appears in the Clipboard window.
   b. Click [B].
2. **Click the Feature Information icon.** The Feature Properties dialog will appear.

FIGURE 7-36. *Sample Feature Properties Dialog*



3. **Check the Skin of the Earth check box and click [OK]**.

MODIFYING A FEATURE IN THE ENC EDITOR

If a feature on your chart has changed, you could update the chart by deleting a feature and then creating a new one at the same location. However, it is quicker and easier to just modify the feature associated with the same spatial record.

1. **Select the spatial record in the map window**. The Selections window will appear with the name and ID of the selected spatial.
2. **In the Selections window, click the B** to display the associated features in the browser.
3. **Double-click on the feature that you want to change.** The browser automatically switches to the Feature tab with the same feature selected.
4. **Click the Change Selected Features icon.** A Create Feature dialog will appear.
5. **Select a new feature of the same type as the original feature and click [OK].** The original feature will be replaced with the new one.

More Information

- “Modifying Chain Direction” on page 7-222

MOVING A FEATURE IN THE ENC EDITOR

There are two ways to move a feature. The method you choose depends on how the spatials and features are constructed and what you are trying to accomplish.

- **Moving All Features with their Spatial Reference in the ENC EDITOR**: Each feature is assigned to a spatial record which defines its position. If you want to move all features assigned to the spatial record, just change the coordinates of the spatial record.
- **Moving Features to a New Spatial Record:** If you have more than one feature assigned to a spatial record, but you don't want to relocate them all, it is a little more complicated. You must create another spatial and reassign the feature (or features) to the new spatial record.

MOVING ALL FEATURES WITH THEIR SPATIAL REFERENCE IN THE ENC EDITOR

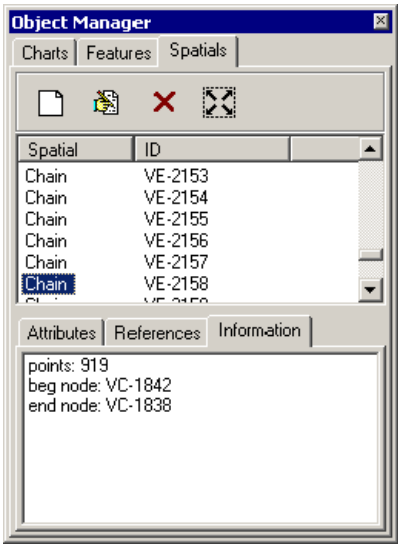
If you have the XY coordinates at the new position, you can identify the spatial and enter the new position in the Point Editor dialog.

You can also use the cursor to drag points in the chart geometry display in the Editor window. Additional lines will appear to display the projected results of the move. This method is probably most useful when you don't need exact positioning. Though the cursor positioning is displayed in the status bar, it is still difficult to position nodes exactly using this method.

Moving Spatial Records through the Point Editor:

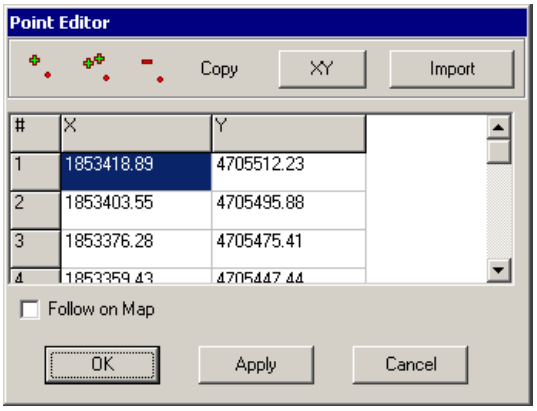
1. **Find the feature that you want to move** in your chart display.
2. **Set the Editor chart display to show only the spatial data** using the icons on the tool bar.
3. **Select the spatial associated with the feature.** (It will become highlighted and the selected point or line segment will turn red.) It will also be listed in the Clipboard window.
4. **Verify you want to move all features associated with the spatial record.**
   a. **Click [B]** in the Clipboard window, to automatically select the spatial to which your feature is referenced in the listing in the Object Manager's Spatial tab.
   b. **Check the list of associated features** in the References tab of the Object Manager.

FIGURE 7-37. *Connected Node selected in the Object Manager*



5. **Click [E] in the Editor window**and the Points Editor dialog will appear with a display of the point coordinates that define the spatial position.

FIGURE 7-38. *Editing the Coordinates in the Point Editor*



6. **Elect whether to display XY or Lat/Lon. coordinates.** The button on the tool bar toggles between the two options.
7. **Change the coordinates in the Points Editor** to define the new location and click [OK]. Depending on the distance you are moving the spatial and the scale at which you have set your chart display, you may see the symbol move on the chart.

Moving Spatial Records using the Cursor:

You can use the cursor to drag points in the chart geometry display in the Editor window. Additional lines will appear to display the projected results of the move.

This method is probably most useful when you don't need exact positioning. Though the cursor positioning is displayed in the status bar, it is still difficult to position nodes exactly using this method.

1. **Set the Editor chart display to show only the spatial data** using the icons on the tool bar. Depress the Show Geometry icon. Deselect the Show Chart icon.
2. **Click on the double ended arrow** icon.
3. **Drag the point or points in the spatial record to the new location**.

NOTE: You can abort the operation by clicking the Escape key *before releasing the mouse button*.

MOVING FEATURES TO A NEW SPATIAL RECORD IN THE ENC EDITOR

If you have more than one feature assigned to a spatial record, but you don't want to relocate them all, it is a little more complicated. You must create another spatial and reassign the feature (or features) to the new spatial record.

We already know how to create a spatial record. Now we have to move the feature.

1. **Select the feature** in the Features tab of the Object Editor. The spatial reference is listed under "References" on the right side of the tab.
2. **Remove the link** between the feature and the current spatial information.
3. **Select the spatial reference and click the Remove Attribute icon.** You will be asked to confirm that you want to remove the attribute.
4. **Click [Yes]** and the reference will be removed.
5. **Assign the feature to the new spatial record**.

More Information

- "Working with Spatial Records" on page 7-217
- "Assigning Feature Position" on page 7-231

DELETING A FEATURE IN THE ENC EDITOR

It is important in this process to remember the difference between spatial records and features, as well as the results of deleting a feature versus deleting a spatial record.

A **feature** is an object with all of its descriptive data *except its position.* When you delete a feature, you will delete one object that is associated to a spatial record.

The spatial record is the position information. *If you delete the spatial record, the ENC EDITOR cannot display any of the features* that had been referenced to it because it no longer knows where to draw them.

Beware!

BEWARE! *Before you delete a spatial record,* always check the list of features associated with it to be sure you are not deleting something important.

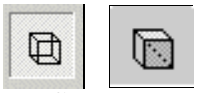
To delete a feature, select it in the Features tab of the Object Manager and click the Remove Feature Icon.

That sounds simple, right? Well, not quite. The trick is sorting through the potentially lengthy list of features and spatial records to find the one you want to delete. For example, the Features tab may list many lateral buoys and you have to find the one you want to delete.

Most often, it will be easier for you to select it first in the Editor window then delete it in the Object Manager. Here's how it works.

1. **Find the feature that you want to delete** in your chart display.
2. **Set the Editor chart display to show only the spatial data** using the icons on the tool bar. Depress the Show Geometry icon. Deselect the Show Chart icon.

FIGURE 7-39. *Show Geometry Icon (left), Show Chart Icon (right)*



3. **Select the spatial object associated with the feature** by clicking on it in the chart. (It will become highlighted and the selected point or line segment will turn red.) It will also be listed in the Selections Window.

FIGURE 7-40. *Selected Point (left) , Chain (right)*

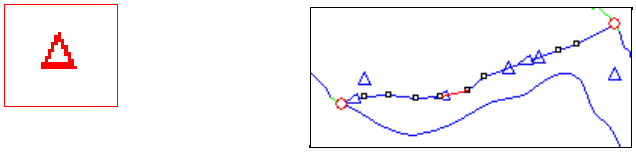
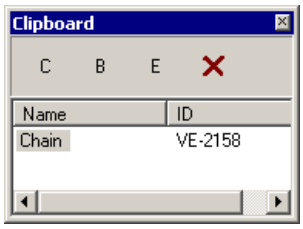
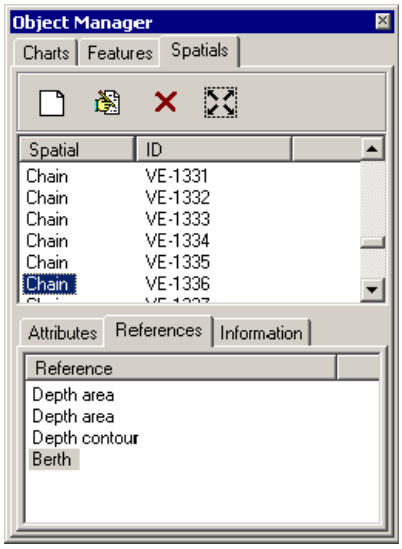


FIGURE 7-41. *Chain Shown in the Clipboard Window*



4. **Click [B]** in the Clipboard window, to automatically select the spatial in the Object Manager's Spatial tab.

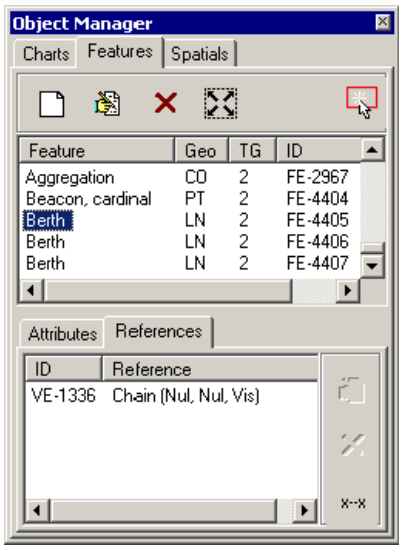
FIGURE 7-42. Object Manager—Spatials Tab



Remember, for every object listed in the Object Manager, there is additional information about it. The Spatials tab includes a listing of the features that are associated with the selected spatial. The feature that you are deleting should be listed there.

5. **Double-click the feature in the Reference list of the Spatials tab**. The Object Manager will change to the Features tab with your selected feature highlighted.

FIGURE 7-43. Object Manager—Features Tab



6. **Click the Remove Feature icon.** You must confirm that you want to delete the feature, then it will be removed.

CLIPPING A FEATURE AGAINST ANOTHER

When you have two features, you may have need to edit them in a number of ways and for a number of reasons. For example:

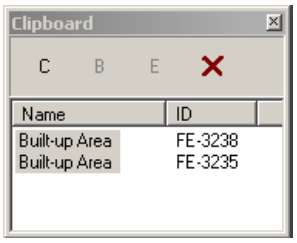
- For the physical features to make sense. (Overlapping land areas of different types would not really occur.)
- To adhere to S57 spatial rules. (There should be a connected node where a chain segments intersect and features cannot extend beyond the chart borders.)

To clip one feature against another:

1. **Drag two features (not the spatials), each of line or area type, to the clipboard.**

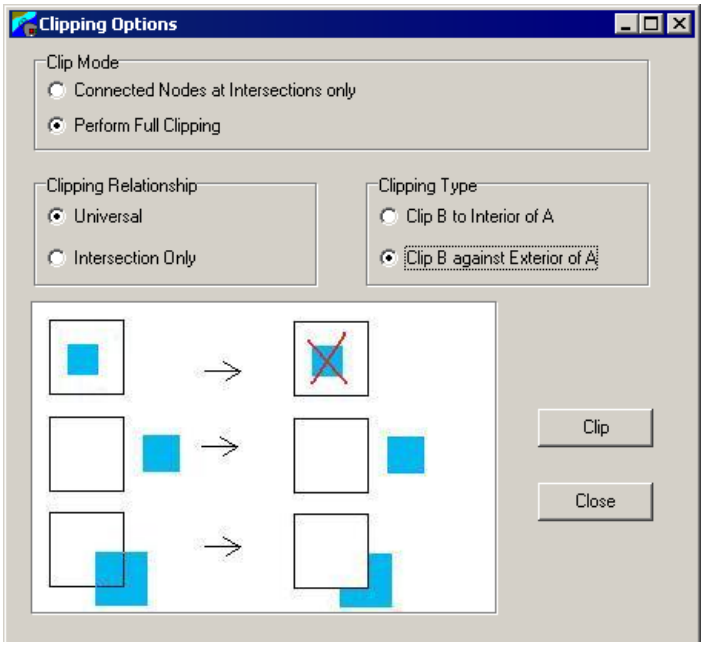
   NOTE: *The order is important.* The first line or area is the one against which the other is clipped.

FIGURE 7-44. *Two Area Features in the Clipboard*



2. **Click [Clip Ftr].** The Clipping Options dialog will appear.

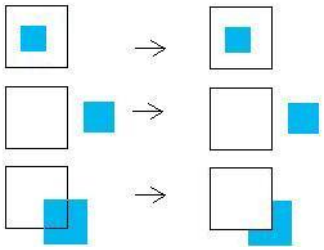
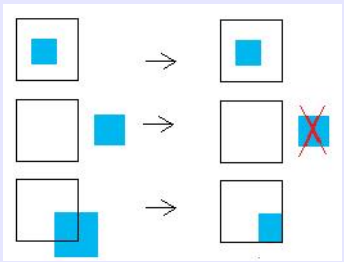
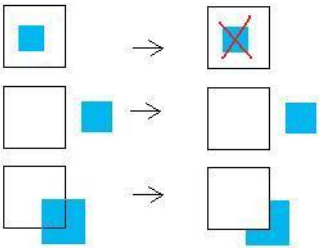
FIGURE 7-45. *Clipping Options Dialog The White Square Represents the first Feature in the Clipboard*

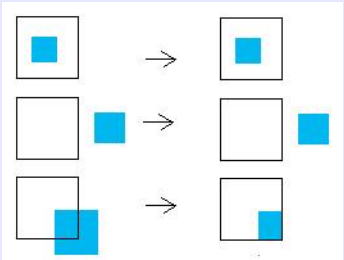
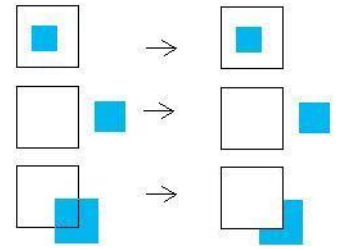


3. **Select your clipping options.** There are several clipping results depending on the chosen feature types—line or area—and the combination of selected options. The diagram in the dialog, where the white square represents the first feature in the clipboard and the blue thesecond, updates to reflect the results of each set of options.

NOTE: If you are clipping against a line feature, only the 'Connected Nodes Only' option is available.

TABLE 7-1. *Full Clipping Options*

Relationship	Clip Type		Results Diagram
Connected Nodes Only	Not Applicable	If chains intersect, inserts connected nodes at the intersections.	
Universal	B against Internal A	Keeps A and B only where it falls within A.	
	B against External A	Keeps A and B only where it falls outside A.	

Relationship	Clip Type		Results Diagram
Intersection	B against Internal A	If chains intersect, keeps B only where it falls within A.	
	B against External A	If chains intersect, keeps B only where it falls outside A.	

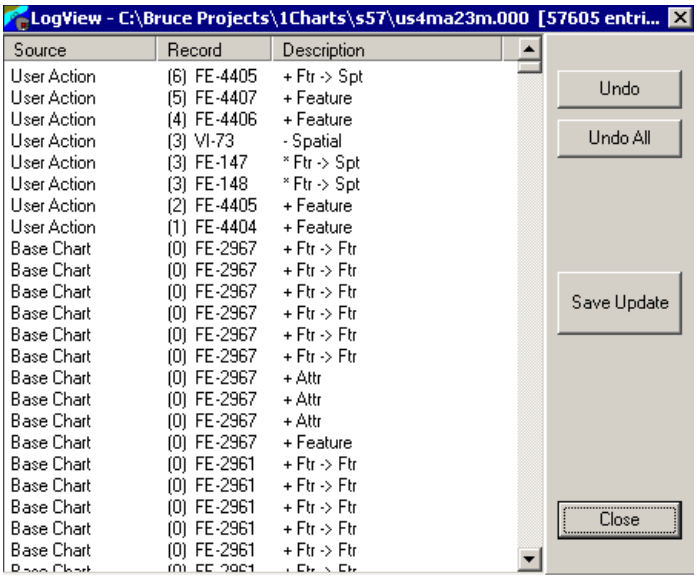
4. **Click [Clip].** The feature display automatically updates in the map.

TIP: If the results are not what you intended, click [Undo] and try again.

REVERSING EDIT OPERATIONS

Each change is recorded as user actions in a log. This log can be viewed clicking the glasses icon in the Charts Tab. Each operation is comprised of one or more edits marked with the same number in parentheses.

FIGURE 7-46. *Viewing the Edit Log*



Each time you click **[Undo],** your latest action will be reversed; the chart features will return to their previous state and the corresponding entries (all those of the same number) will be removed from the log.

[Undo All] reverses all of 'User Action' operations, returning you to the base chart in it's original state.

[Save Update] saves all user actions to an update chart file in your project. The file name will use the original root and increment the extension by one from the latest update in your project.

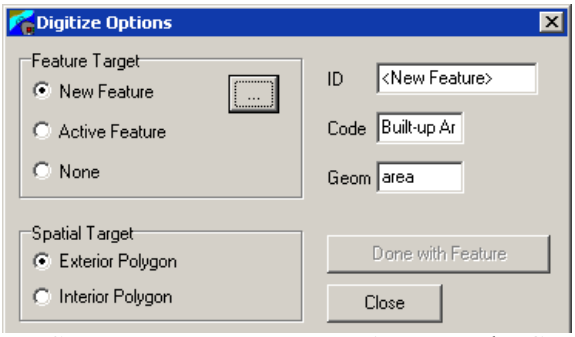
NOTE: For a complete chart display that includes your work, you should load your base chart *and* its update charts.

CREATING FEATURES WITH DIGITIZE OPTIONS

The DigiOps routine automatically generates both the spatial and feature records as you use your cursor to digitize a feature in the Editor map display.

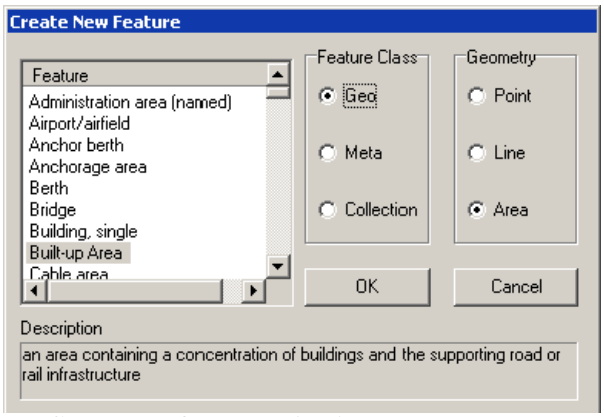
1. **Click [DigiOpts].** The Digitize Options dialog will appear.

FIGURE 7-47. *Digitize Options Dialog*



2. **Select New Feature and click [...].** The Create New Feature dialog will appear.

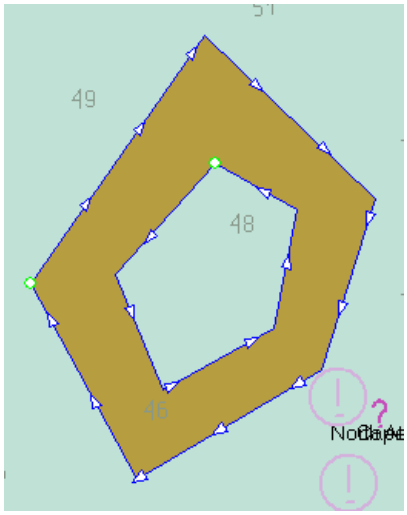
FIGURE 7-48. *Create New Feature Dialog*



3. **Select the feature with its class and geometry and click [OK].**
   If you have chosen a feature with Area geometry, the Spatial Target options will be enabled in the Digitize Options dialog.
4. **If you are creating an area object, choose a spatial target.**
   - **Exterior Polygon:** You are describing the area inside the polygon.
   - **Interior Polygon:** You are describing an area outside the polygon.

   NOTE: Take care to describe your polygon in the correct direction—clockwise for exterior polygons and counterclockwise for interior polygons.

FIGURE 7-49. *Exterior and Interior Polygons*



5. **Use the [+chain] and [+ Con] tools to digitize your feature in the map display.** When the first spatial is completed, the feature and its spatial reference automatically appear in the Object Manager. As each

chain or node is added to the feature, the spatial is added in the feature's reference list.

6. **Click [Done with Feature]**.
7. **For each additional feature, repeat the process from step 2.**
8. **When you have finished digitizing features, click [Close].**

More Information

- "Creating Spatial Records using the Cursor" on page 7-219
- "Chain Direction Affects the Area Described" on page 7-221

ADDING DXF OR DGN CHART DATA TO YOUR S57 CHARTS

The ENC EDITOR can read data from DXF and DGN charts and enables you to incorporate it into a new or existing S57 chart. DXF/DGN chart information can be used to create additional spatial features.

There are two methods:

This is really a two phase process:

- **Importing the DXF/DGN file**.
- **Converting the DXF/DGN features to S57 features**.

Save your S57 chart by selecting the Save Chart icon.

- **If you are creating a new chart**, you are free to name it whatever you want within the confines of the S57 naming convention.
- **If you are updating a chart**, you probably want to adjust the name in a way that you know the chart from which it originated and its revision.

IMPORTING DXF/DGN CHARTS TO YOUR S57 CHARTS

1. **If you are creating a new chart, note the minimum and maximum latitudes and longitudes.** (HYPACK® users can use that to display the DXF/DGN and see where it falls on your grid.)
2. **Open the ENC EDITOR**.
3. **Set the geodesy** to match the project's geodesy. This assures that the S57 chart and your DXF/DGN chart are in the same place.
4. **Load a chart.**
   - **Create a new chart** using your lat./lon. positions.
   - **Load an existing S57 chart** for the area.
5. **Enter your Chart Information.**
6. **Import your HYPACK® DXF/DGN file**.
   a. **Select S57-IMPORT** and a file open dialog will appear.

b. **Select your file type and file.** The chart data will be displayed in the map window of the Editor and an additional tab will be included in the Object Manager with a feature listing for each item found in the DXF/DGN

7. **Verify the imported chart falls within the boundaries of the S57 chart**. To do this, display the chart geometry, which will include the chart boundary. All data must fall within your chart boundary to comply with S57 chart standards.
   - **If you want to update an existing chart**, but your data extends beyond the boundaries, you must clip your data to fit the chart boundary or delete those points that are outside the chart boundaries.
   - **If you are creating a new chart**, you can begin again, adjusting the Lat./Lon of your boundaries to accommodate your data.

More Information

- "Defining your Chart Information" on page 7-209

Converting DXF/DGN Features to S57 Features

Once the ENC EDITOR has read the DXF/DGN data, the next step is to convert the DXF/DGN features to the S57 spatial/feature pairs. This can be done manually or, if you imported a DXF chart of certain specifications from the TIN MODEL program, it can also be done automatically.

Manual Conversion of DXF/DGN Features to S57 Features:

1. **Select the DXF/DGN feature that you want to include in your S57 chart**. When you select a DXF/DGN feature, it will be displayed in red in the Editor and highlighted in the Object Manager.
   - **In the Object Manager:** Hold the Shift key and select the first and last point in a range or hold the Ctrl key and select individual points.
   - **In the Editor display:** Click [+P] on the imported file tab in the Object Manager then select the points in the map. You may select multiple points in a region by clicking and dragging a rectangle.

2. **Use the buttons at the bottom of the DXF tab to convert the selected feature or features**.

Button	Function
Chain 1:1	Converts each selected DXF/DGN polyline feature to a chain spatial object. This could be useful if you have several DXF/DGN features that should all be converted to chains. You would then need to assign S57 features to each chain.
Chain N:1	Converts point objects, targets or C-points to a chain spatial object. **NOTE:** They will be joined in the order in which they appear in the Object Manager.
Snd N:1	Converts all selected points to a single sounding record.
Ftr 1:1	Converts each selected feature to an individual S57 feature. For example, if you have multiple rocks, you can convert them all at once.
Ftr N:1	Converts all selected DXF/DGN features to a single S57 feature. For example, depth areas and land masses are often described by more than one chain. Select them all (in order and in the proper direction) to create the S57 feature.

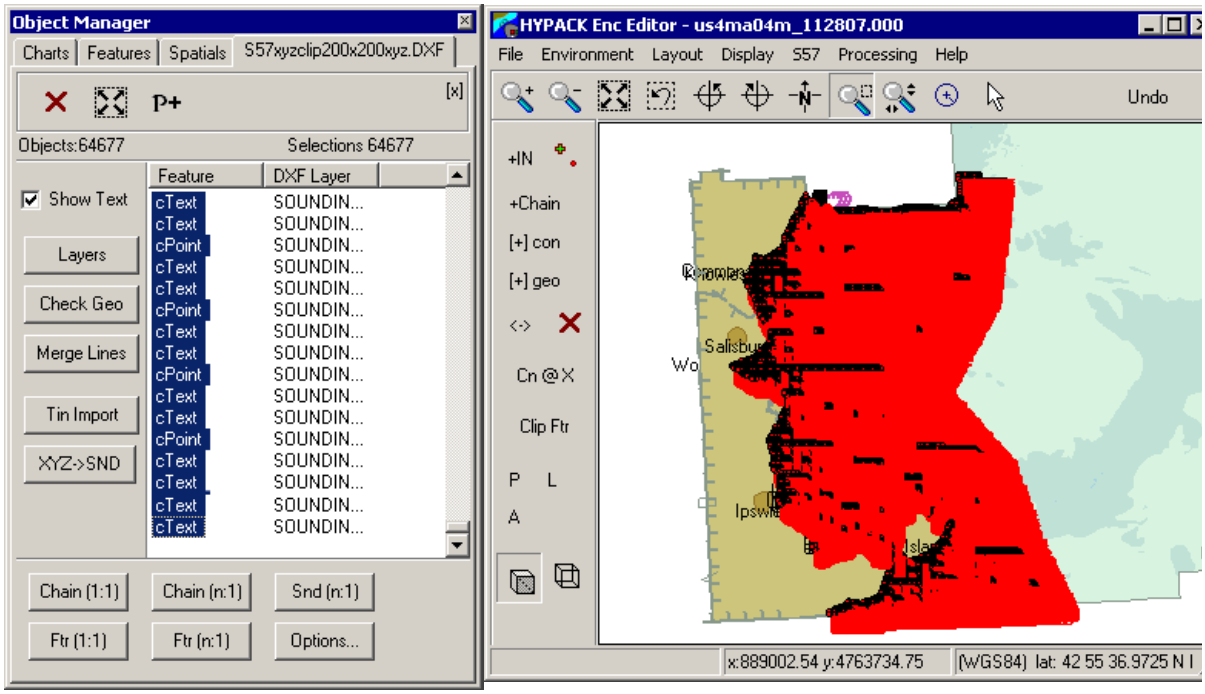
As each conversion is made, the spatial and feature records will be added to their respective tabs. You can choose to also remove them from the DXF tab by clicking [Options] in the DXF tab and selecting "**Delete Entries after Conversion**".

In the following examples, we have already loaded a DXF file to a new S57 chart. Each example uses a different conversion button. The first example converts soundings. In the last three conversions the DXF file contains contour lines.

Converting with Snd N:1:

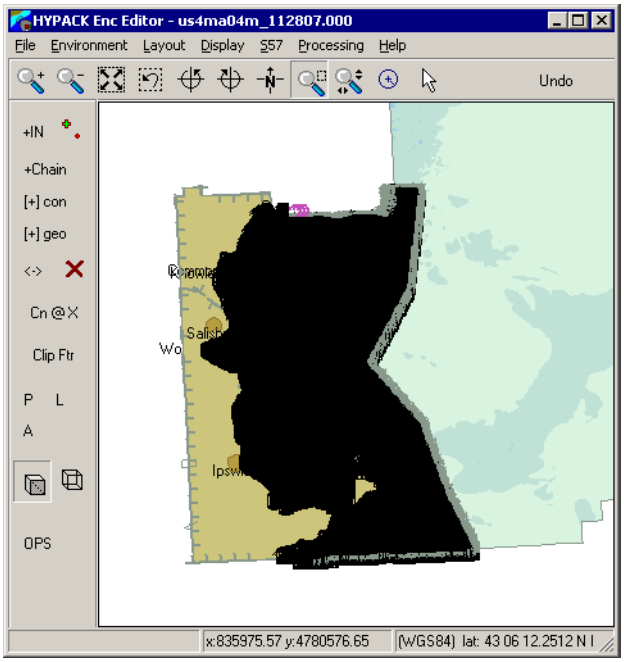
1. **Select all text objects that represent soundings** from your DXF/DGN.

FIGURE 7-50. *All Soundings Selected*



2. **Click [Snd N:1].** All of the soundings are converted to a spot sounding feature.

FIGURE 7-51. *Soundings Converted*



Converting with Chain 1:1

1. **Select the contour.** The contour shows red and the feature is highlighted in the Object Manager.

2. **Click [Chain 1:1] a**nd the selected feature will be converted to a chain spatial object.

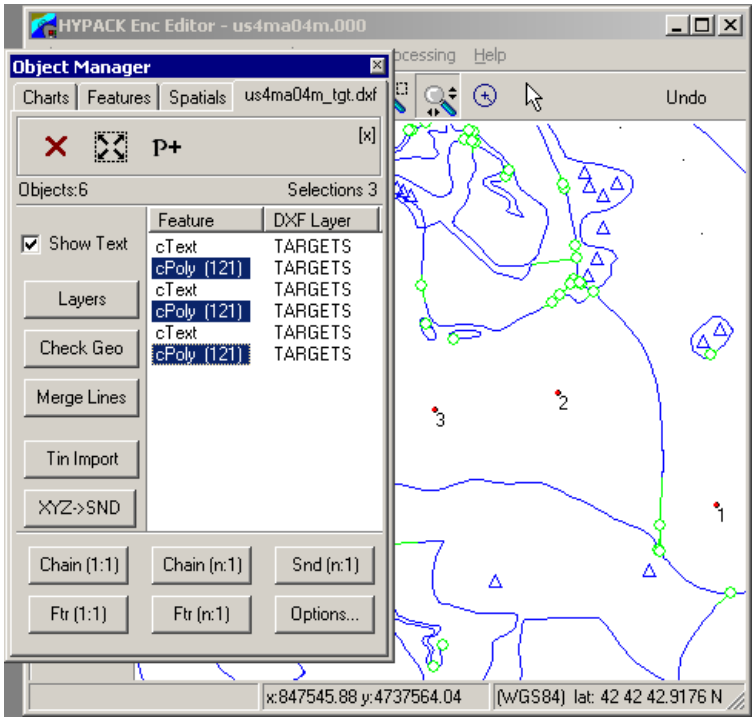
Using this method, you have only spatial information. You would still need to create the Depth Contour line feature and assign it to the chain spatial record.

Converting with Chain N:1

1. **Select multiple point objects, targets or C-points**. The point shows red and the feature is highlighted in the Object Manager.

NOTE: Soundings objects are not supported in this operation.

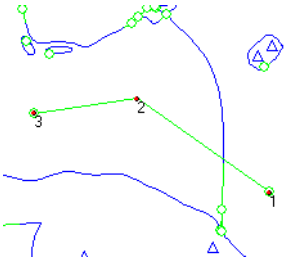
FIGURE 7-52. *Multiple Targets Selected*



2. **Click [Chain N:1]** and the selected feature will be converted to a chain.

NOTE: They will be joined in the order in which they appear in the Object Manager.

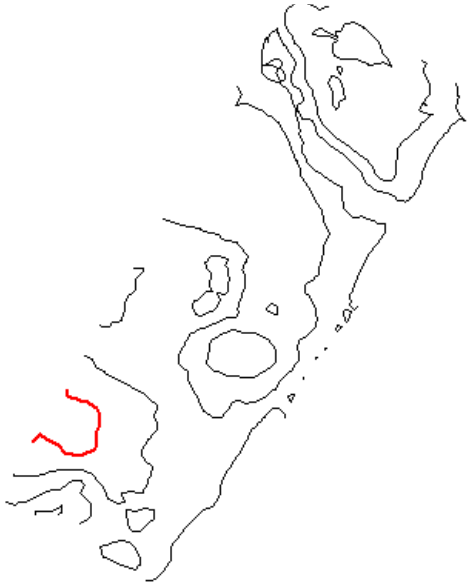
FIGURE 7-53. Selected Targets Converted



Converting with FTR 1:1

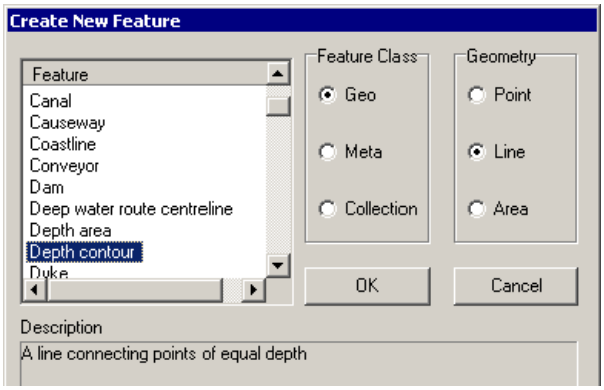
1. **Select the contour.** The contour shows red and the feature is highlighted in the Object Manager.

FIGURE 7-54. Selecting a DXF Feature



2. **Click [FTR 1:1]** and the Create New Feature dialog will appear.

FIGURE 7-55. Create New Feature Dialog



3. **Select the Filter.** In this case, we should select “Line” because the selected chain is not a closed polygon. The dialog will now only show line features.

4. **Select "Depth Contour" and click [OK].** Both the chain spatial object and the reference to a depth contour feature will be created for you.

If you are importing a HYPACK® DXF contour file, a single operation can convert all of the DXF contours to S57 contours, each with the correct depths attribute.

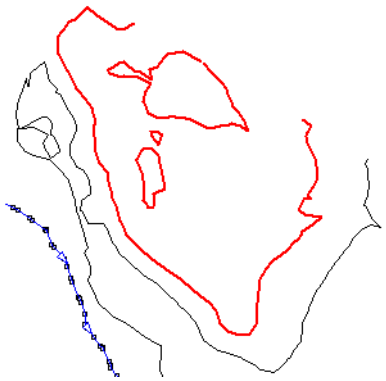
1. **Import your DXF chart**.
2. **In the DXF tab in the Object Manager, click [Options], check the 'Depth Value Attributes from DXF Name' option** and click [OK]
3. **Select any number of contours**.
4. **Click the Ftr1:1 button**.
5. **Select Line geometry and the Depth Contour feature, and click [OK].** The program reads the depth value attribute for each selected DXF contour, converts the contour to an S57 depth contour and assigns the correct depth attribute.

Converting with Ftr N:1:

In this case, instead of creating a contour, we'll create a depth area. This particular area has a few "islands" in the middle of it, so it requires multiple chains to describe it.

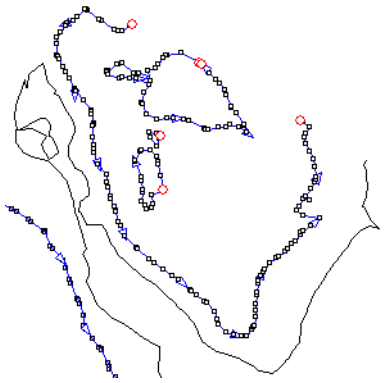
1. **Select multiple features** holding the shift key.

FIGURE 7-56. *Selecting multiple DXF Features*



2. **Click [Ftr N:1]** and the Create New Feature dialog will appear.
3. **Select the area filter and Depth Area** from the list and click [OK].

FIGURE 7-57. Four chains converted



4. **Check the line directions.** Remember the chain describes something to the right. Be sure all of the chains' directions are set so the "right-hand" sides are all toward the depth area we are describing. In this example, we reversed the direction of three of the chains. It was a good thing we checked!

More Information

- "Modifying Chain Direction" on page 7-222

Automatic Conversion of TIN Model Contours in your S57 Chart

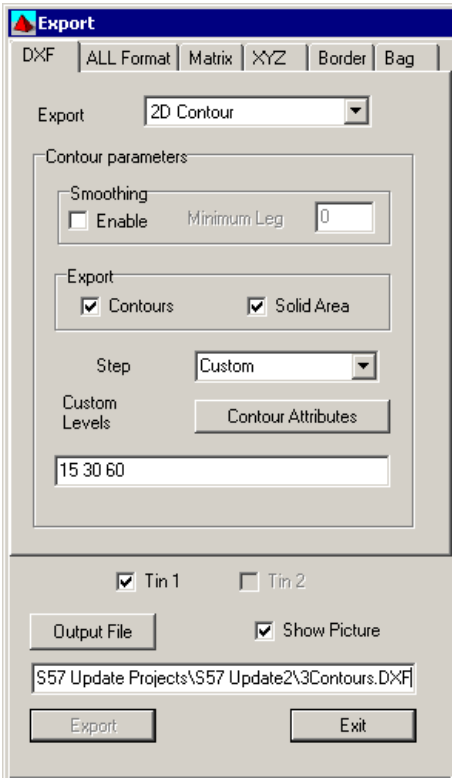
The ENC EDITOR enables you to import 2-dimensional filled contour files, created in the HYPACK® TIN MODEL program and, with a click of one button, automatically incorporate them into your S57 chart.

File Specifications:

The **DXF files** must be created in a particular manner in order to contain the information in the format necessary for the ENC EDITOR.

- It must be created through the HYPACK® TIN MODEL program.
- It must contain both contour lines and solid fill.
- It can contain no labels as the ENC EDITOR requires unbroken polylines.
- It must have exactly three custom levels. They will be read by the program as the three standard shallow, deep and safety zones of S57 charts.

FIGURE 7-58. *Exporting DXF Files from the TIN MODEL Program for ENC EDITOR*



NOTE: The fill colors are unimportant as they are not displayed once the file is imported to the S57 chart. The ENC EDITOR reads the depths from the DXF and colors it according to the S57 Display Options.

Once the DXF has been imported to your S57 chart and verified that it lies within the S57 boundaries, you are ready to convert. Click [TIN Import]. The program will automatically merge the contour data with the S57 chart. If your data covers a large area, it may not look like much at first, but click the "Show Chart" icon and zoom in and the chart will display the S57 colors according to your S57 Display Options.

FIGURE 7-59. *The DXF file loaded to the ENC EDITOR*

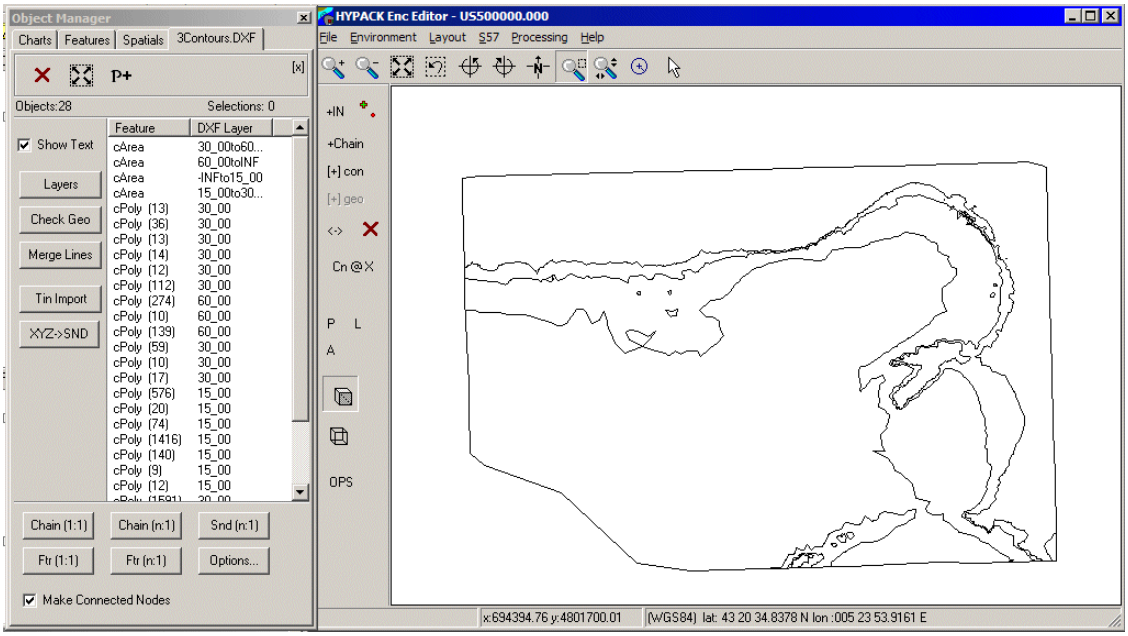
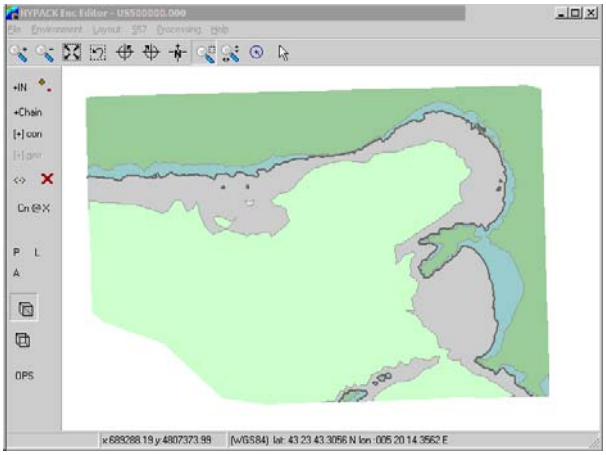


FIGURE 7-60. *The DXF file merged in the S57 Chart*



ADDING XYZ DATA TO YOUR S57 CHART

The ENC EDITOR can read XYZ data and enables you to incorporate it into a new or existing S57 chart. XYZ information can be used to create additional spatial features. This is really a two phase process:

- **Importing the XYZ file**.
- **Converting the data to S57 features**

The XYZ file can be either space or comma delimited. The program assumes the depth units match those indicated in your project geodesy settings, and converts them, as necessary to the units set in the Chart

Information. They will, in turn, display according to the S57 display options (S57-DISPLAY OPTIONS).

TIP: If your data set is large or dense, you may want to consider changing the font settings so the text will not obliterate the other chart features or thinning the XYZ data set before you import it.

1. **Select S57-IMPORT** and a File Open dialog will appear.
   a. **Select the XYZ file type**.
   b. **Select the XYZ file and click [Open].** The selected file will load to the editor and display with your chart. A tab named with the file name is generated in the Object Manager to display your data points.
2. **Verify that the soundings within the S57 chart boundaries** you are creating or updating.
3. **Merge your data** with the chart.
   - **[XYZ->SND]** converts all coordinate triads in your file to a single sounding feature.
   - Additional options allow you to create a spatial object at selected points from your imported data set. The Feature options also enable you to create a feature associated with the spatial object.

   a. **Select your points.**
      - **In the list in the Object Manager**. Hold the Shift key and select the first and last point in a range or hold the Ctrl key and select individual points.
      - **In the Editor display:** Click [+P] on the imported file tab in the Object Manager then select the points in the map. You may select multiple points in a region by clicking and dragging a rectangle.

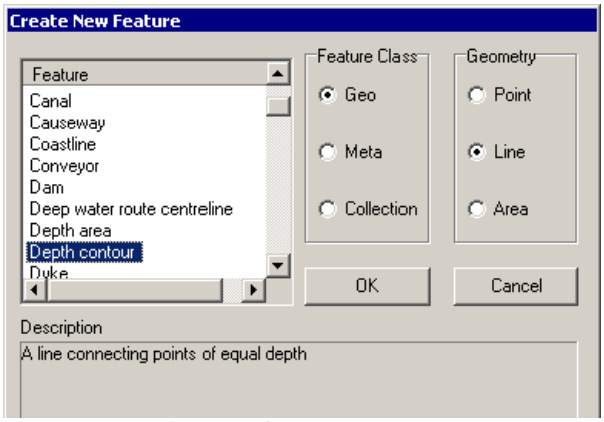
   b. **Click one of the following buttons according to your needs:**
      - **[Snd N:1]** converts all selected points to a single sounding feature.
      - **[Ch N:1]** connects all selected points to form a chain spatial feature.
      - **[Ftr 1:1]:** For each selected point, it generates a point feature with the same user-defined feature object. A dialog will appear for you to select your point feature object.

NOTE: You *must* select the *point geometry* and choose a *point feature*. Otherwise, no features will be generated.

      - **[Ftr N:1]:** Use this to generate line or area features from your selected points. It connects all selected points to form a chain or area feature. A dialog will appear for you to select your spatial feature class and geometry, and the associated feature object.

NOTE: If you select point geometry and a point feature, a spatial record will be created at each point, but generate only 1 point feature positioned on the first spatial record.

FIGURE 7-61. *Create New Feature Dialog*



c. **Describe the feature class and geometry**. The Feature list updates accordingly.

d. **Select the type of feature and click [OK].** The specified objects will be generated and displayed in the Editor window.

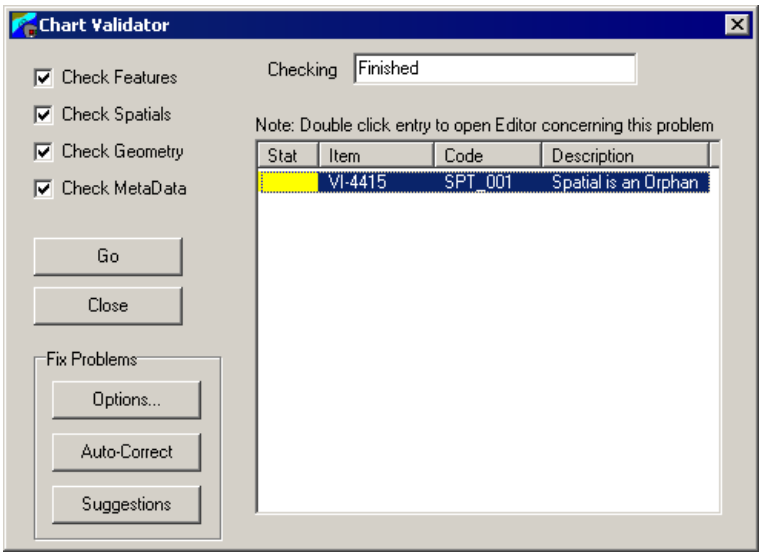
VALIDATING YOUR CHART

Chart validation is an optional routine you can use to automatically scan your chart for anything that breaks S57 specifications. The Chart Validator lists each feature with an error, specifies the error type and provides feedback and tools with which to correct the error.

To validate the chart currently open in the ENC EDITOR:

1. **Select PROCESSING-VALIDATE CHART.** The Chart Validator will appear.
2. **Select the portions of the chart you wish to validate** by checking the corresponding check box for each.
   - Feature records
   - Spatial records
   - Chart geometry
   - Metadata

FIGURE 7-62. Sample Chart Validator Display



3. **Click [Go].** You can monitor the progress by the changing names of each feature in the 'Checking' field as it is evaluated.

   When the process is complete, the feature names will be replaced by 'Finished' and any problems will be listed in the dialog.
4. **Click [Suggestions]** (Optional) to see if the program has any suggested resolutions for the problem.
5. **Click [Options...] and select the resolutions** that match the problems listed in the validator and click [OK].

   NOTE: The Chart Validator can not autocorrect every type of problem so there may be some you may have to correct manually.
6. **Select the problems you want to autocorrect and click [AutoCorrect].** The Validator corrects all problems it can according to the selected options; those items are removed from the list.
7. **Manually correct remaining problems**.

   NOTE: Often, if you double-click the item in the Chart Validator, it will open the interface required to correct that item.
8. **Revalidate your chart** (Optional) to confirm all possible errors have been corrected and that no new ones have been created.
9. **Save the resulting chart**.

TIP: Occasionally, the ENC Editor fails to draw certain corrected features. If you feel this is the case, ask the program to recheck all of the features and redraw the chart according to its new findings by selecting PROCESSING-RECHECK FEATURES FOR DRAWING.

SAVING YOUR MODIFIED S57 CHART

To save the chart, with all of its changes, to a single chart, select the Charts tab in the Object Manager and click the Save icon. You can overwrite the (original) base chart file or provide a new name for the updated chart.

To save a chart update, separately from the base chart:

1. **Click the Show Log icon** in the Chart tab of the Object Manager. The Logview will appear.

2. **Click [Save Update].** The features marked 'User Action' are saved to a file using the same root name as the base chart, and incrementing the extension *from the most recent update chart*.

EXAMPLE: IMPORTING HYPACK® DATA TO A NEW CHART IN ENC EDITOR

Example: Importing DXF Charts and XYZ files to the ENC EDITOR

We will create an S57 Chart with a DXF chart, then overlay the corresponding soundings. The new chart will be named FR503350_10_07update.000

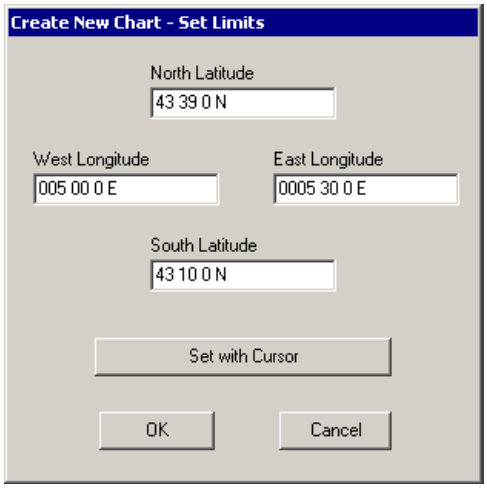
The FR503350_10_07update.DXF has been created from the FR503350_10_07update.XYZ file using the HYPACK® TIN Model program with three levels at 15, 30 and 60. Before we closed HYPACK®, we took note of the geodesy settings and approximate minimum and maximum lat./lon. values as follows:

Geodesy:	Grid: UTM North Distance unit: Meters	Zone 31 Ellipsoid: WGS84
Min. and Max. Lat./Lon.:	43 39 0 N 43 10 0 N	005 00 0 E 005 30 0 E

Now we're ready to build our chart in the ENC EDITOR.

1. **Launch the ENC EDITOR** by selecting FINAL PRODUCTS – ENC EDITOR.
2. **Load your chart**. In this example, we are creating a new chart. Click the "Create New Chart" icon and enter the Lat./Lon. values noted in HYPACK®.

FIGURE 7-63. *Defining the Boundaries of your Chart*



3. **Enter your Chart Information**. In the following dialog, we have accepted the default settings for the Exchange Purpose, S57 Edition Number, Product Specification Number and Application Profile ID. We have entered what will be the chart name under Data Set Name. Since it is a new chart, it makes sense to leave Edition Number = 1 and Update Number = 0. A new chart would have the same Update and Issue Dates.

FIGURE 7-64. *Entering the Chart Information*

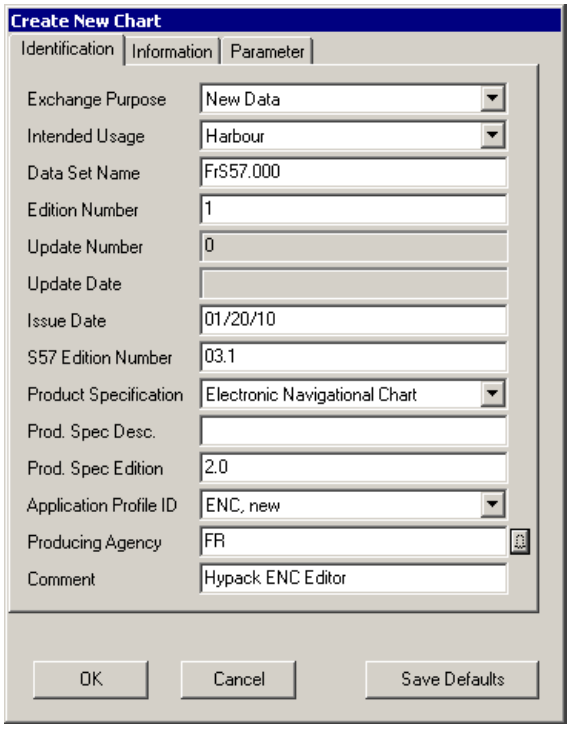
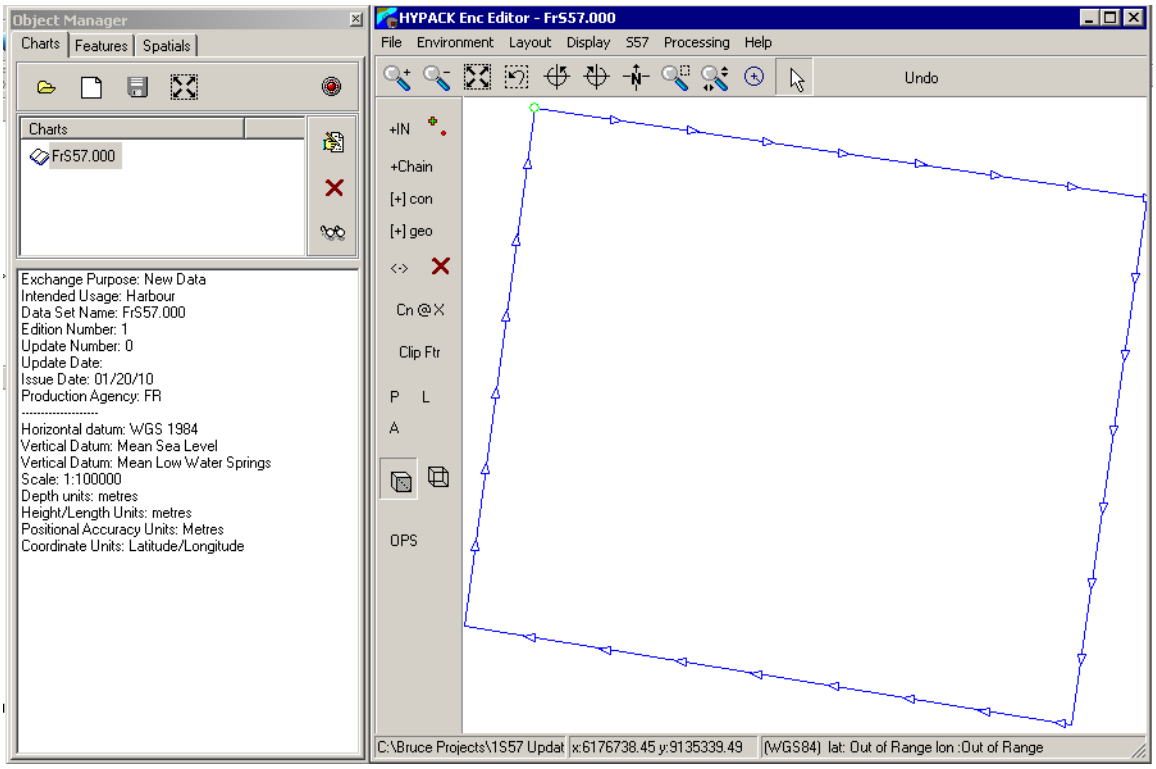
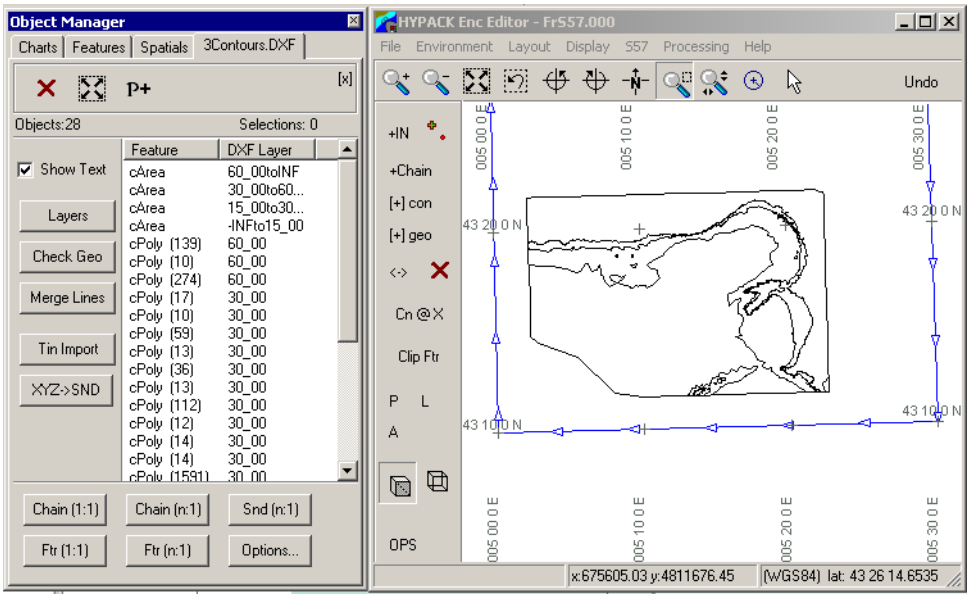


FIGURE 7-65. *Chart Boundaries—No Chart Features*



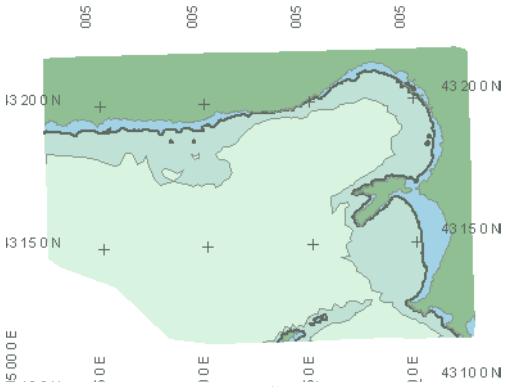
4. **Import the DXF file.**
   a. **Select S57-IMPORT** and a file open dialog will appear.
   b. **Select the DXF file type.**
   c. **Select the FR503350_10_07update.DXF file and click [Open].** The selected file will load to the editor and display with your chart.
   d. **Verify that the DXF chart falls within the S57 chart boundaries** you are creating.

FIGURE 7-66. *The DXF file loaded to the ENC EDITOR*



e. **Merge your data with the chart** by clicking [TIN Import].

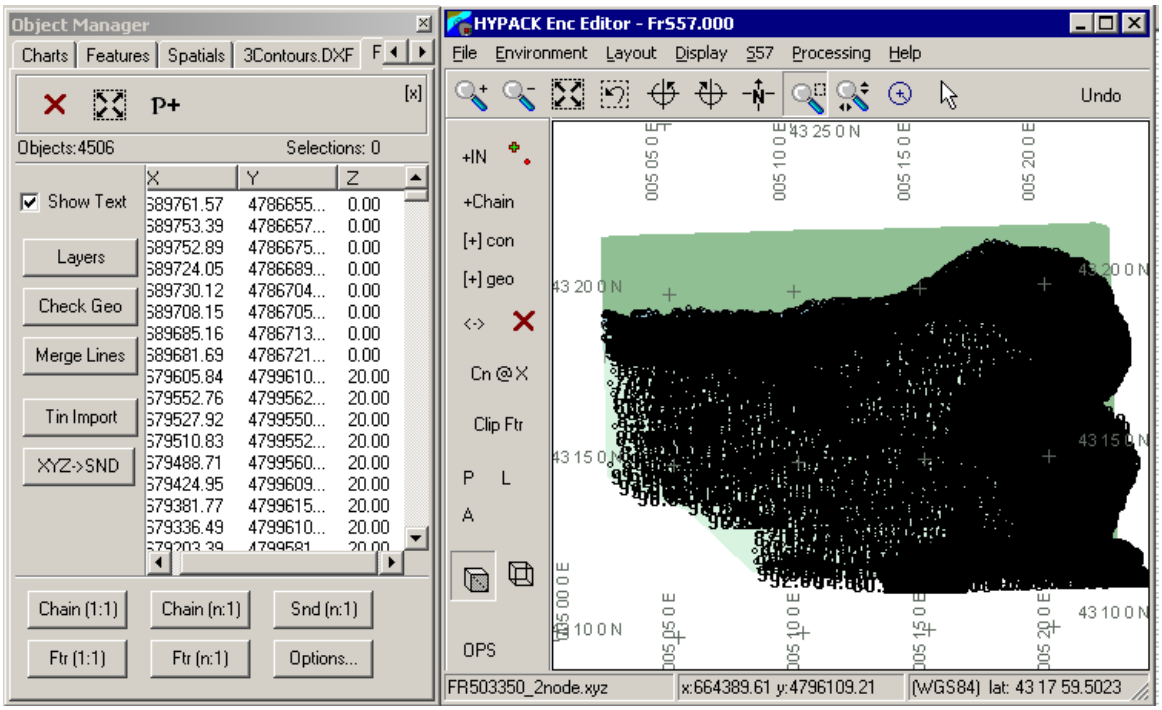
FIGURE 7-67. *Zoom in to the edge of the DXF file merged into the ENC EDITOR*



5. **Import the XYZ file**.
   a. **Select S57-IMPORT** and a file open dialog will appear.
   b. **Select the XYZ file type.**
   c. **Select the** FR503350_10_07update**.XYZ file and click [Open].** The selected file will load to the editor and display with your chart.
   d. **Verify that the soundings are within the S57 chart boundaries** you are creating.

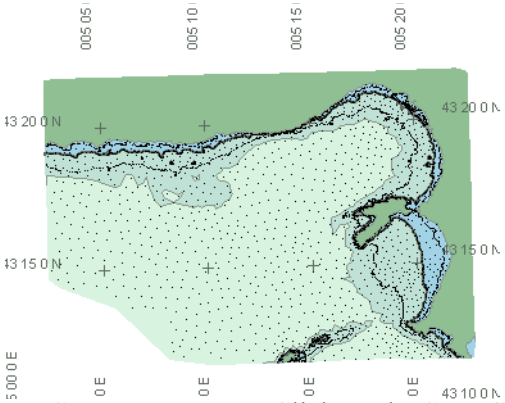
      Notice that, at first glance, it appears that the soundings extend beyond the chart boundary. Zoom in to be sure. You may find that it's only the text extending beyond the boundaries. If this is not the case, you must begin again and extend the boundaries to encompass your update data.

FIGURE 7-68. *The XYZ file loaded to the ENC EDITOR*



6. **Merge your data with the chart** by clicking [XYZ->SND].

FIGURE 7-69. *Resulting S57 Chart with Merged Soundings*



7. **Save your chart**. Click on the Save Chart icon and name it FR503350_10_07update.000.

More Information

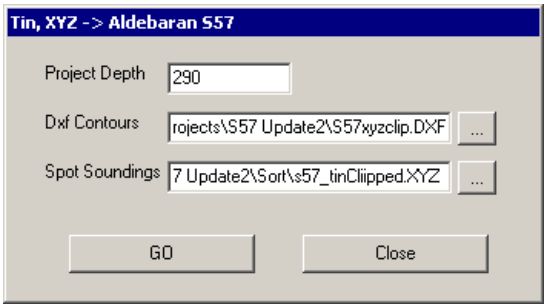
- "Defining your Chart Information" on page 7-209

ALDEBARAN TOOLS

The Aldebaran tools provide semi-automated procedures for generating S57 charts with specific data, attributes, attribte values and metadata settings. You will construct these charts based on your survey data in DXF and XYZ formats.

1. **Prepare your data files**.
   - **DXF Contours:** The DXF file must be generated by the TIN MODEL program to enable the automation in this tool.
   - **XYZ Files:** Consider the density of the soundings in your data set. You may need to thin your data to improve readability when you display the chart.
2. **Launch the ENC EDITOR**.
3. **Select PROCESSING-ALDEBARAN CHART**. The Aldebaran dialog will appear.

FIGURE 7-70. *Aldebaran Dialog*



4. **Enter your project depth and data files.** As each file is loaded, it will appear in the editor display.
5. **Load your chart.** You can generate a new chart or load an existing chart that you want to update with your DXF and XYZ data.
6. **TIP:** When generating a new chart, the data file display in the editor map guides you in the placement of the chart boundaries.**If you are creating a new chart, define your chart information** in the Object Manager.
7. **In the Aldebaran dialog, click [Go].** Your data files will update your chart.
8. **Close the Aldebaran dialog**.
9. **Save your chart.** Click the Save icon on the Chart tab of the Object Editor and name your updated chart.

More Information

- “Creating a New Chart” on page 7-205
- “Loading an Existing S57 Chart” on page 7-207
- “Defining your Chart Information” on page 7-209

NEW ORLEANS SOUNDING OVERLAY TOOLS

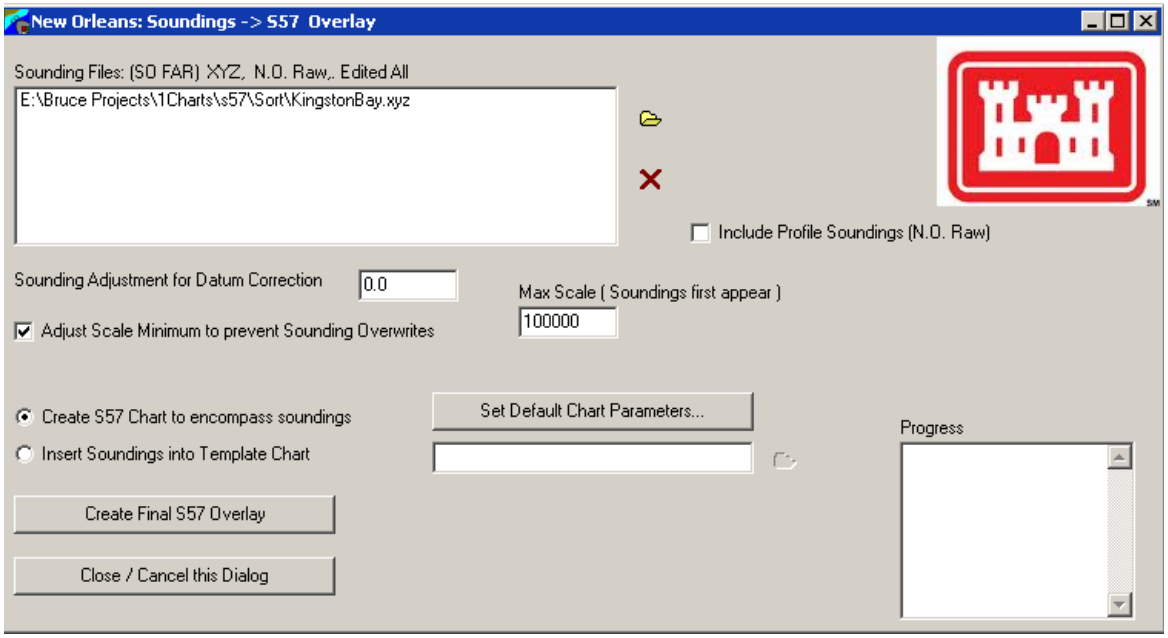
The New Orleans Overlay tools provide semi-automated procedures for generating S57 charts with current sounding data. With this tool, you can pursue either of two strategies:

- **Create an overlay chart** containing only the sounding data. The overlay chart is a very small chart file used to supplement data in a chart that is otherwise complete. Its size enables you to easily transmit it to other users.
- **Create a whole new chart** based on an existing chart on which you will overlay the current sounding data. *The template chart will not be changed*. Only a copy of it will be modified and ultimately saved to a new file name.

CREATING CHARTS WITH CURRENT SOUNDINGS

1. **Select PROCESSING-NEW ORLEANS OVERLAY**. The New Orleans Overlay dialog will appear.

FIGURE 7-71. *New Orleans Overlay Dialog*

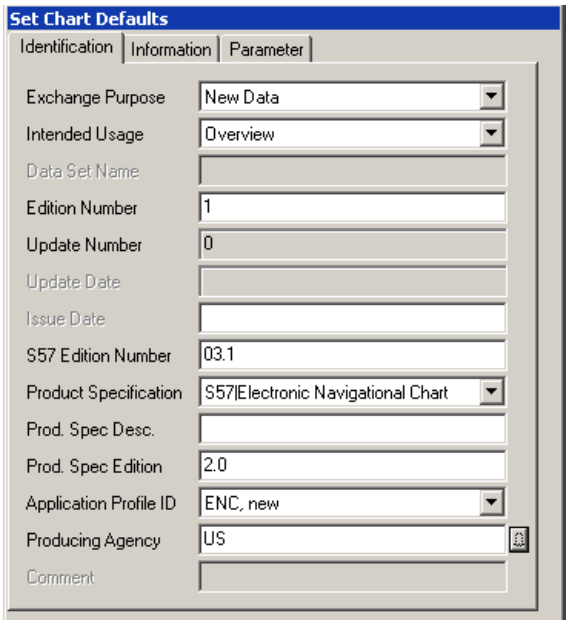


2. **Load one or more sounding files** to be incorporated into the overlay chart file. the New Orleans Overlay tool supports Edited All, XYZ and New Orleans Raw formats.
   a. **Click the File Open icon** next to the Sounding Files field.

   b. **Browse to select your sounding data and click [Open].**
3. **Set your Sounding Options**.

4. **Set your Chart Options** to determine whether you will generate an overlay chart or update an existing chart.
   - **To create an overlay chart:**
     i. **Select 'Create S57 Chart to encompass soundings'**.
     ii. **Click [Set Default Chart Parameters]**.
     iii. **Enter your chart information and click [Close]**.

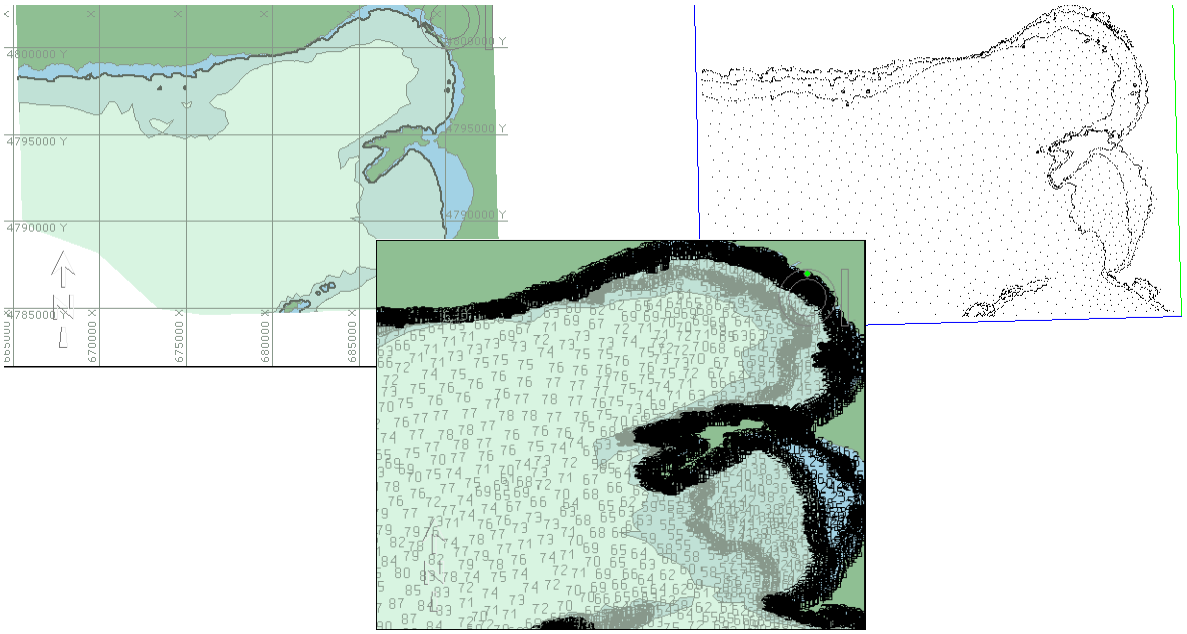
FIGURE 7-72. *Entering Chart Information*



   - **To create a complete chart:**
     i. **Select 'Insert Soundings into Template Chart'**.
     ii. **Click the File Open icon and browse to select the S57 chart** on which you will overlay your sounding data.

     iii. **Click [Open]**.
5. **Click [Create Final S57 Overlay]**. The resulting chart will be saved to the project folder.

FIGURE 7-73. *Template Chart (top left), Sounding Overlay (top right), Template Chart with Overlay Chart (bottom)*



More Information

- "Sounding Overlay Sounding Options" on page 7-266
- "Defining your Chart Information" on page 7-209

SOUNDING OVERLAY SOUNDING OPTIONS

The ENC EDITOR can use Edited All, XYZ and New Orleans Raw formats to generate a sounding overlay chart file or create an complete updated chart.

Include Profile Soundings integrates the profile soundings with the depths from a New Orleans Raw format sounding file.

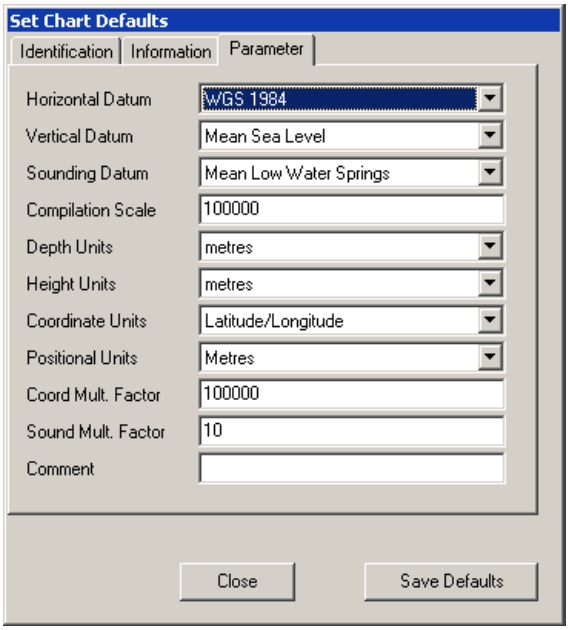
Sounding Adjustment for Datum Correction: The program adds this value to each sounding, then places the result in the new chart.

Adjust Scale Minimum to Prevent Sounding Overwrites: Soundings first display in ECS/ECDIS charts at the user-specified **Maximum Scale**. When this zoom scale is reached, soundings appear, but they are gridded with sufficient spacing to make them readable at varying zoom scales. To accomplish this, the number of soundings displayed in a given area changes with the zoom range. The algorithm will attempt to insert depths from shallowest to deepest. This gives least depths priority and thus the first chance to be displayed at the highest minimum scale.

NOTE: Any sounding which hasn't found a scale for clear writing by the time the minimum scale has been reached will just be inserted into the chart at the minimum scale.

This is *for display purposes only. It does not thin your data*.

FIGURE 7-74. *Setting the Chart Parameters*



NOTE: The settings are maintained specifically for this dialog in its own persistent section of the encEdit.ini file. This means, any settings adjusted here won't affect the default chart settings used in other parts of the editor. This also means that you needn't configure chart options each time you create an overlay; they will be maintained between editor sessions.

ON-SITE CHART VERIFICATION WITH HYPACK® SURVEY

HYPACK, Inc. has combined the functions of the ENC EDITOR program and the HYSWEEP® SURVEY program to enable you to perform on-site modifications of point features in an S57 chart. It has been developed, initially, for use in chart feature verification work where users wanted to make changes to their charts while on the water.

The two programs are run simultaneously. HYPACK® SURVEY is used for navigation and to provide position information to the ENC EDITOR.

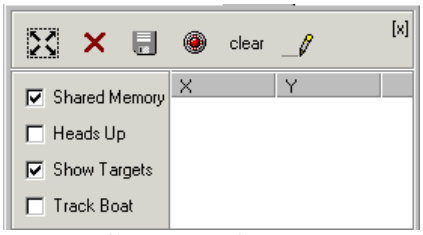
The ENC EDITOR reads data from Shared Memory to position new or existing point features in your S57 chart. Here's how it works.

1. **Set up your project in HYPACK®**.
   a. **Set your geodetic parameters**.
   b. **Load your S57 chart**.

   NOTE: You may load more than one chart, but the ENC EDITOR can only work within one chart at a time.

   c. **Launch HYPACK® SURVEY**.
2. **Set up the ENC EDITOR**.
   a. **Set the geodesy options** to match your HYPACK® geodesy.
   b. **Select PROCESSING-SURVEY SHARED MEMORY.** The Shared Memory dialog will appear.

FIGURE 7-75. *Shared Memory Dialog*



   c. **Check the Shared Memory and Show Targets options**. Track Boat is optional. Shared Memory allows the ENC EDITOR to read the data from HYPACK® SURVEY.
      - **Shared Memory** allows the ENC EDITOR to read the data from HYPACK® SURVEY.
      - **Vessel Up** orients your display so your vessel is traveling toward the top. This is the equivalent to the "Vessel Up" Map Orientation in SURVEY.
      - **Show Targets** displays enabled target files as dots labeled with large white T's. The **X, Y coordinates** of targets displayed in the ENC EDITOR are listed in the center window.
      - **Track Boat** keeps the display centered on the vessel. This is the equivalent to the "In Center" Vessel Tracking in SURVEY.

   If a target file is enabled in HYPACK® SURVEY when the ENC EDITOR is loaded, the ENC EDITOR will load the selected target.

   To display an entire target file click the Load Target File icon and select the file you want to display.

Keep the Shared Memory dialog open as you will need the icons for other parts of your work.

3. **Navigate to your project area**.

As you navigate over your project area, you may find the area has changed since your chart was created. Bottom conditions may have changed requiring buoys to be relocated or new ones to be installed. Perhaps one buoy is replaced by another of a different type. Something may have happened to create a new hazard. The possibilities are endless.

The on-site chart editing typically handled through this program collaboration. It involves three basic operations:

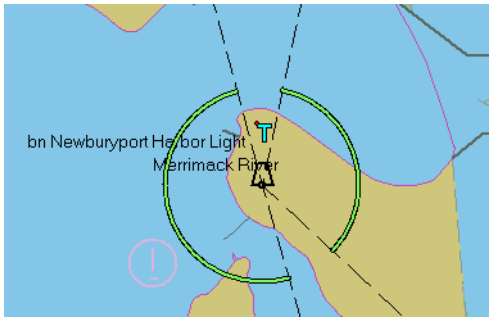
- Relocating an existing point feature.
- Deleting an existing point feature.
- Creating a point feature where none exists.

ON-SITE RELOCATION OF AN EXISTING POINT FEATURE IN THE ENC EDITOR

If the Newburyport harbor light at the mouth of the Merrimack river were shifted to a new location on the point.

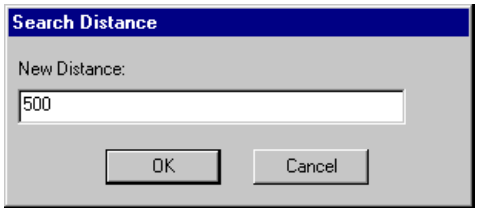
1. **Mark a target**at the current location of the light. A red dot with a 'T' will appear at the target location in the ENC EDITOR and its coordinates will be written in the list on the Shared Memory.
2. **Select the target coordinates in the shared memory dialog**. The 'T' marking the target will turn blue. This indicates the location which the ENC EDITOR will reference.

FIGURE 7-76. *Target marked at the new location for the light*



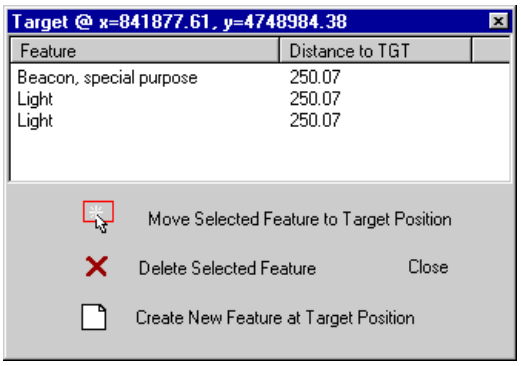
3. **Set your search distance** by clicking the Configure Options icon in the Shared Memory dialog and entering the distance in the dialog that appears.

FIGURE 7-77. *Setting the Search Distance*



4. **Click the Find Objects icon** and all chart features within your search distance of the selected target will be displayed in the features list.

FIGURE 7-78. *Searching for Chart Features*



5. **Select one or more features you want to relocate.** Selected features need not originate from the same location.
6. **Click [Move Selected Feature to Target Location]**. The selected features will be moved to a new spatial record at the target location.

FIGURE 7-79. *Light moved to the new location*

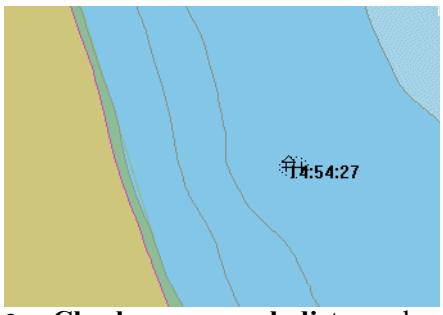
NOTE: If more than one feature is associated with the same node, all features for that node will move. In this example, the beacon and two lights are all assigned to the same node. No matter which feature you select in the list, all of them will move in the chart.

ON-SITE DELETION OF AN EXISTING POINT FEATURE IN THE ENC EDITOR

Farther down the island, the chart has a wreck charted a short distance off shore.

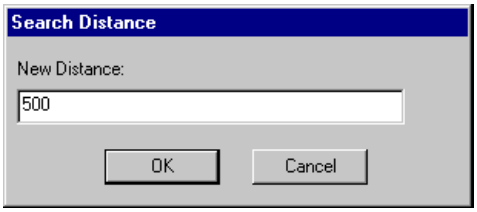
1. **In HYPACK® SURVEY, mark a target on the wreck symbol**.

FIGURE 7-80. Marking the wreck symbol with a target



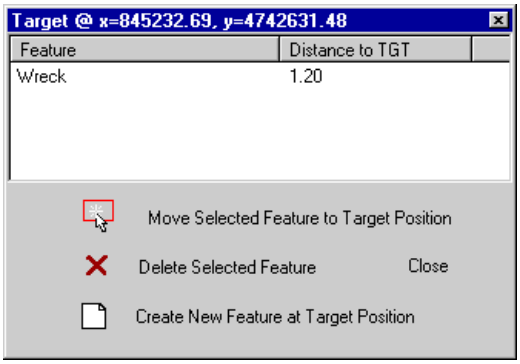
2. **Check your search distance** by clicking the Configure Options icon in the Shared Memory dialog. The default distance is 100 so, unless you have set this to something quite small or have not placed the target on the symbol, it should work.

FIGURE 7-81. Setting the Search Distance



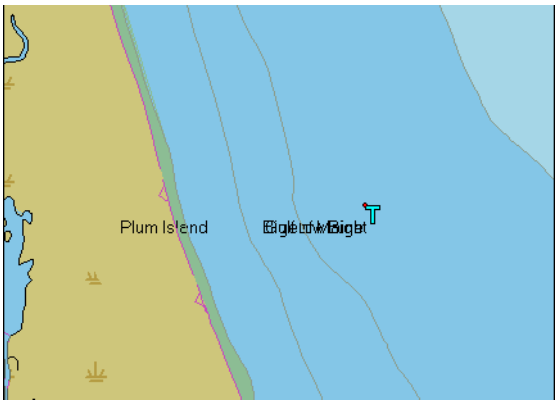
3. **Click the Find Objects icon** and all chart features within your search distance of the selected target will be displayed in the features list.

FIGURE 7-82. Searching for Chart Features



4. **Select the wreck feature and click [Delete Selected Feature]**. The wreck will be removed from the chart, but the target will remain in its location.

FIGURE 7-83. Delete Selected Target Icon



5. **Remove the Target** (optional). You can remove the target, now that it has served its purpose by selecting it in the Shared Memory dialog and clicking the Delete Selected Target icon.

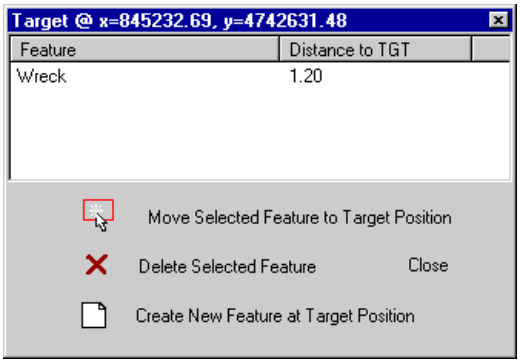
ON-SITE CREATION OF NEW POINT FEATURES IN THE ENC EDITOR

As you navigate your project area, if you discover that a new point feature should be added to the chart, you can quickly add it to your S57 chart with a few simple steps.

In this example, the wreck is there, and has been marked with a buoy that does not appear on your chart. We can create the buoy feature and add it to the chart.

1. **Mark the location of the buoy with a target** in HYPACK® SURVEY.
2. **Click the Find Objects icon.** In this case, you probably do not need the list of nearby chart features, but we do this to access the dialog from which you can create the new feature.

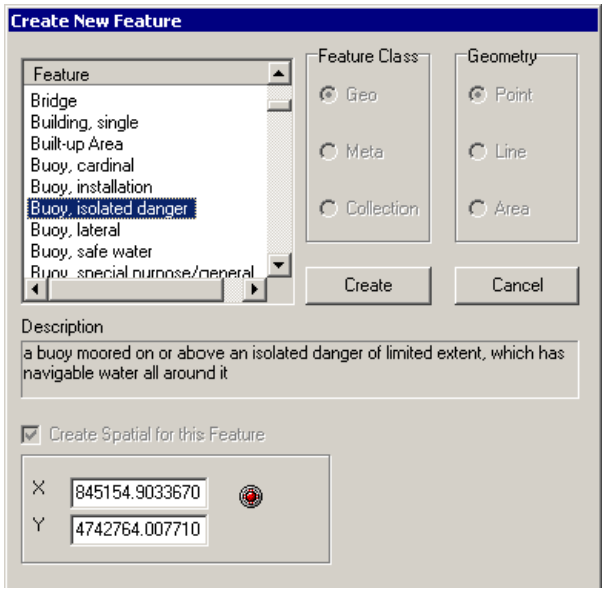
FIGURE 7-84. Searching for Chart Features



3. **Click [Create New Feature at Target Position]**. The Create New Feature dialog will appear with the target location listed as the location where the spatial record should be created.

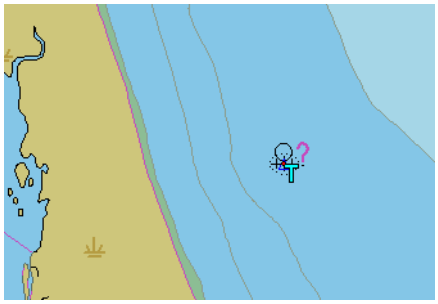
4. **Select the feature you want to create**. For this example, choose "Buoy, isolated danger".

FIGURE 7-85. *Create New Feature Dialog*



5. **Verify that all the information is correct and click [Create]** to generate the feature. You can edit the position coordinates, but if the feature information is not accurate, click [Cancel] and try again.

FIGURE 7-86. *Isolated Danger Buoy is Displayed with the Wreck*



You can create the same feature at multiple targets in a similar manner.

6. **Mark targets at each location in SURVEY.** The coordinates for each target will appear in the Shared Memory dialog.
7. **In the Shared Memory dialog, select all targets at which you want to create a feature**.
8. **Click the red button.** The Create Feature dialog will appear.
9. **Select the feature that you want to place at each target location and click [OK].** The ENC EDITOR will create like features, one at each selected target location.

EXPORTING S57 CHART DATA

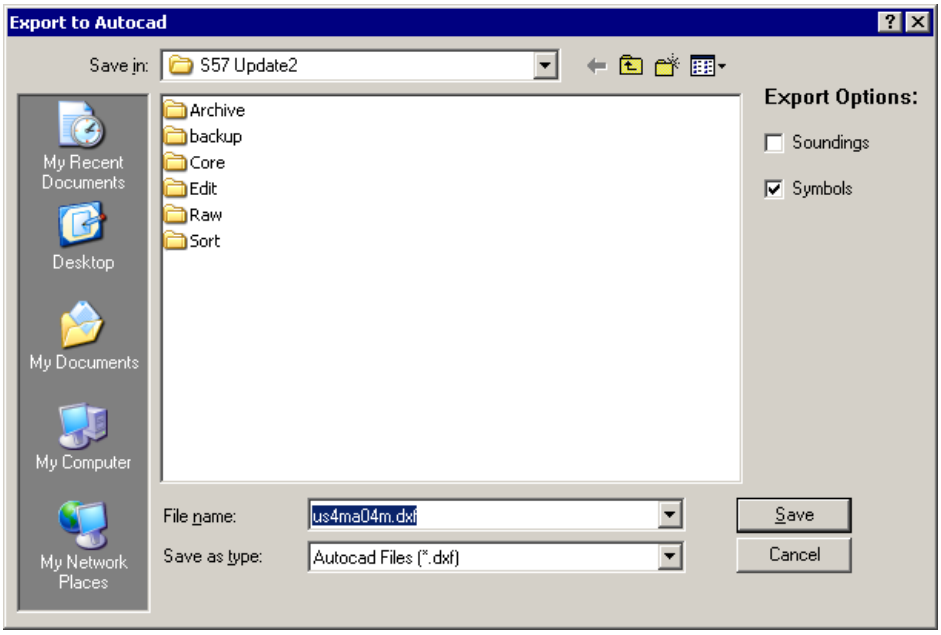
The ENC EDITOR provides a selection of routines that extract select data from your S57 chart and store it to another format for use in another HYPACK® module or in a third-party program.

S57 CHART DATA TO DXF FORMAT

The ENC EDITOR can export S57 chart information for display in AutoCAD. This routine always converts the filled contours, but you may choose whether to include the S57 chart symbols, soundings or both.

1. **Select PROCESSING – EXPORT TO AUTOCAD**. An Export dialog will appear, automatically naming your new chart using the S57 root name and the DXF extension.

FIGURE 7-87. *Export to CAD Dialog*



2. If you want to **include the chart symbols**, check the **Symbols** option.
3. If you want to **include the chart depths**, check the **Soundings** option.
4. **Click [Save]** and the DXF chart will be saved, by default, to your project directory.

FIGURE 7-88. *Original S57 in HYPACK*

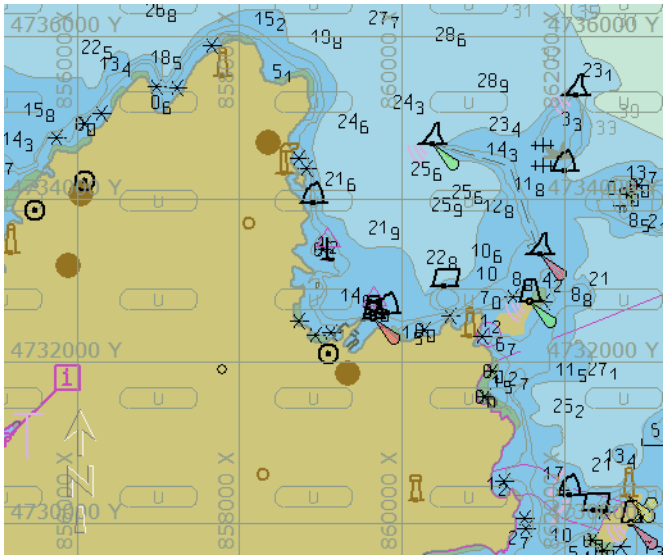
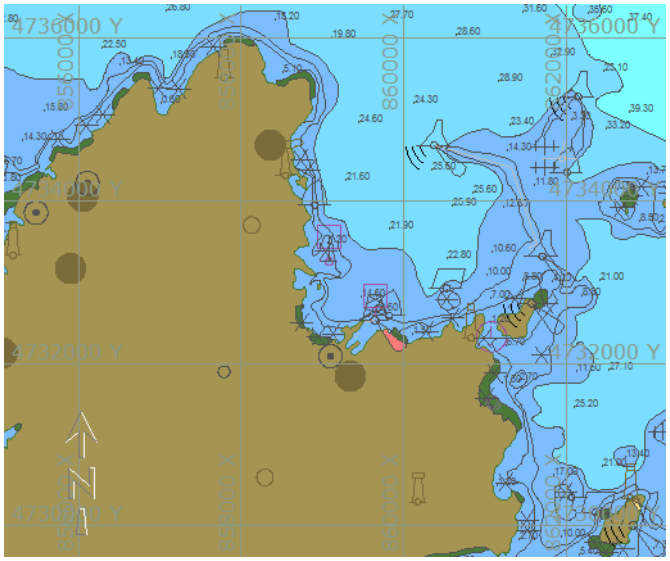


FIGURE 7-89. *Resulting DXF displayed in CAD*



EXPORTING S57 CHART LEVELS TO XYZ FORMAT

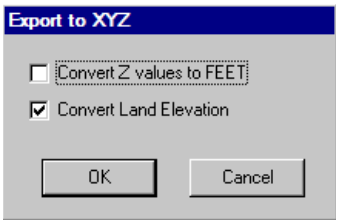
The ENC EDITOR can read the spot depths and elevations, and contour data in the S57 chart and export it to and XYZ file.

The Z values can be exported in meters, as they are stored in the chart, or you can convert them to feet as they are saved to the exported file. This is a handy option if you are surveying in feet.

You export only the soundings and contours in the water to display in HYPACK® or include land contours then load it to the 3D TERRAIN VIEWER and take a virtual tour of your project area.

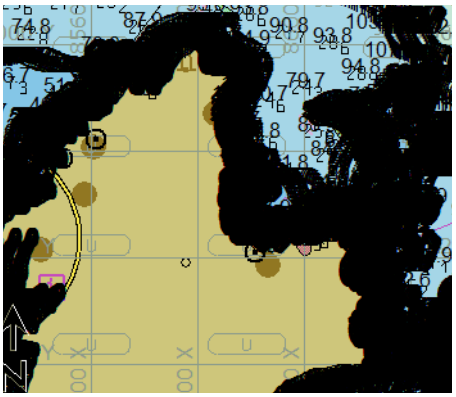
1. **Select PROCESSING-EXPORT TO XYZ.** The Export to XYZ option appears.

FIGURE 7-90. *S57 to XYZ Options*



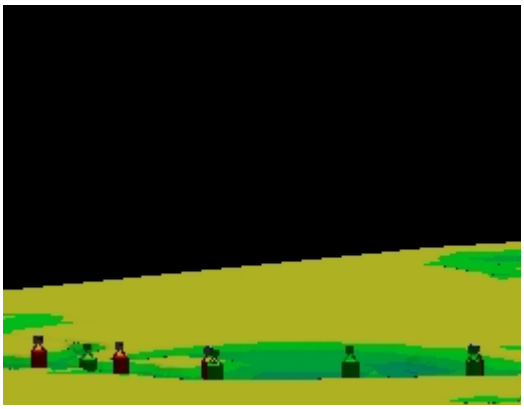
2. **Choose whether to convert your Z values to feet, and whether to include land contours, and click [OK].** The output file will be saved with the root name of the original S57 chart to your project's Sort directory.

FIGURE 7-91. *The Soundings and Contours are exported to XYZ Data*



If you want to display your contours in 3DTV and the exported data is a too thin between the contours, you may want to take it to the TIN MODEL to fill in the spaces, then export it in a more uniform density.

FIGURE 7-92. *XYZ data in 3DTV*

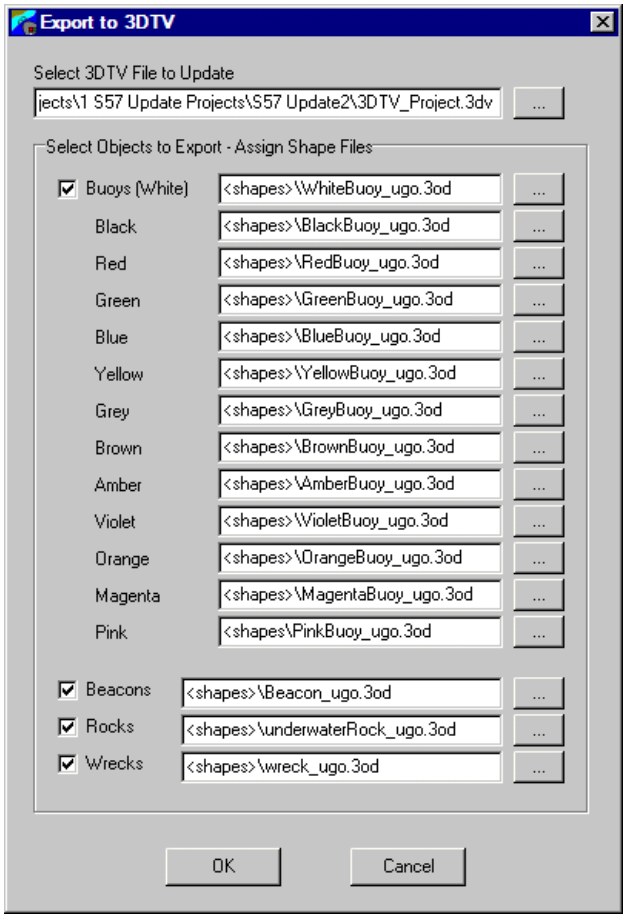


EXPORTING S57 SYMBOLS TO THE 3D TERRAIN VIEWER

Recent developments in the 3D TERRAIN VIEWER allow us to make models of objects in the environment and display them with the terrain model. The ENC EDITOR can read the information in your S57 chart about the buoys, beacons, wrecks and rocks, and update a 3DTV project file to display them next time you load the project to 3DTV.

1. **Select PROCESSING – EXPORT TO 3DTV.** The Export to 3DTV dialog will appear.

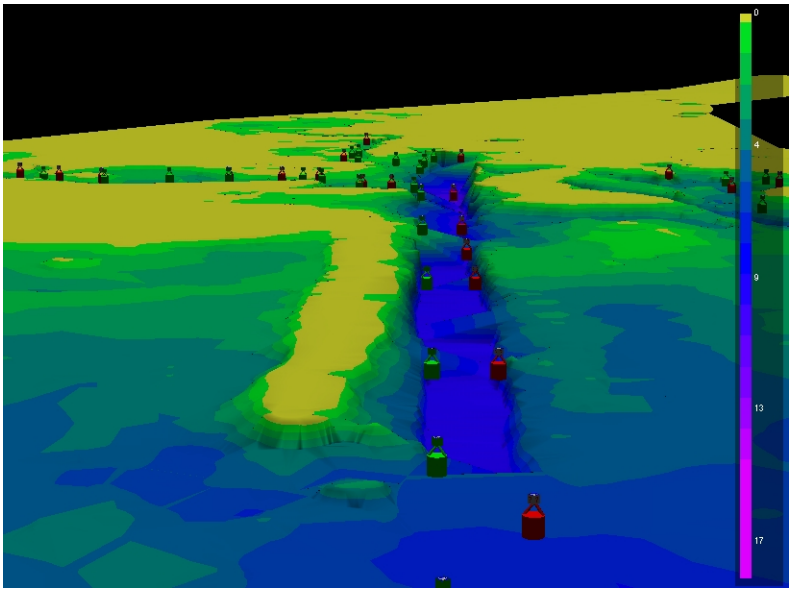
FIGURE 7-93. *S57 to 3DTV Options*



2. **Enter the name of the 3DV file** from your project that will include the chart objects.
3. **Choose which objects from the S57 chart** you want to display in 3DTV.
4. **For each selected object, enter a shape file (*.3OD).** One shape file of each type has been included in your HYPACK® install. You can make your own in the 3D SHAPE EDITOR substitute it for any of the default shapes by clicking the […] and browsing for your shape.
5. **Click [OK]**. A message will appear to tell you that the selected 3DV file has been updated with the S57 information.

FIGURE 7-94. *The original S57 Chart shows rows of buoys marking a channel.*

FIGURE 7-95. *Buoys displayed along a channel in 3DTV*



3D TERRAIN VIEWER

The 3D TERRAIN VIEWER program (also known as 3DTV) is a versatile tool that enables you to closely examine a three-dimensional model of your survey or dredge project area.

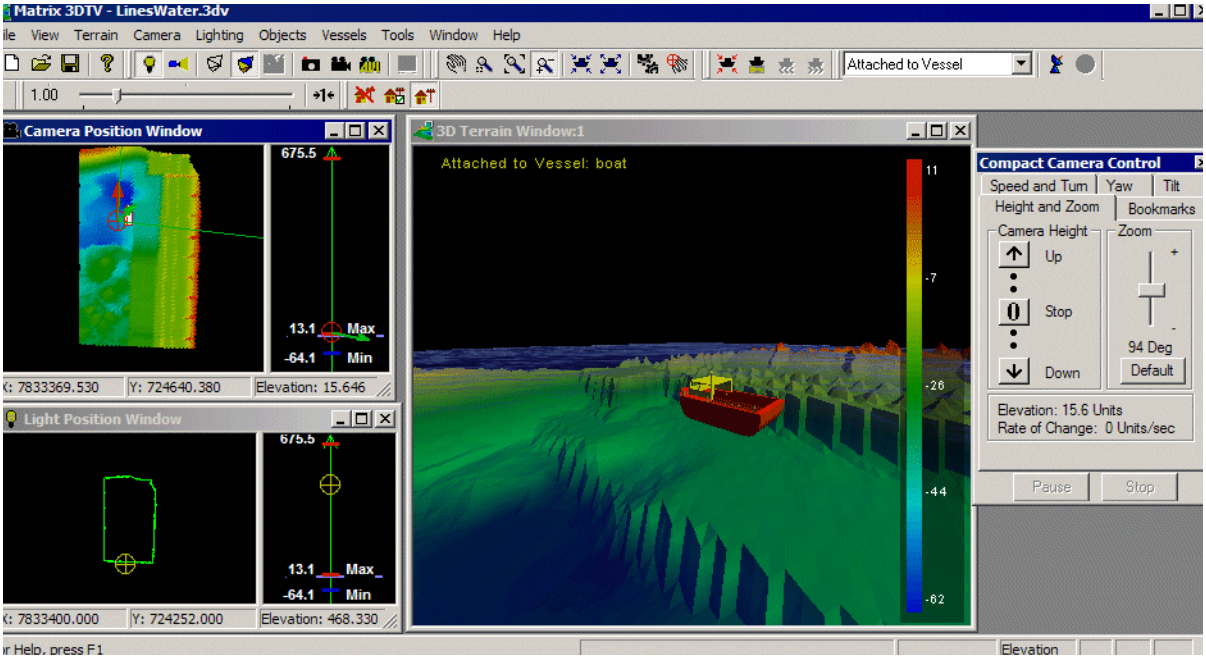
3DTV can be run in two operational modes:

- **3DTV** can be launched from the HYPACK® Final Products menu or from SURVEY or DREDGEPACK® to view existing data from your project area. The 3D Terrain Viewer mode is displayed in the title bar.
- **Matrix 3DTV** is accessed only from SURVEY or DREDGEPACK®. The Matrix 3DTV mode is displayed in the title bar. The file name is read from shared memory. You can watch a real-time representation of your project. The data is loaded from a matrix file and is updated in real time based on new data through shared memory. The display can also include project features such as the channel, survey lines, the water surface and your vessel. If you are set up to receive position data from multiple vessels, you can view your dredge and your cutting tool, your vessel and a towfish, or multiple vessels broadcasting positions in your area over radio network connections.

The scale models of objects such as buildings, buoys, power lines, and bridges can be created in the 3D SHAPE EDITOR and imported to your 3DTV display to provide further realism and additional points of reference on your screen.

Imagine that there is a camera flying above your project area sending the image to your computer and you are at the controls. You can direct the camera's flight to view the model from any angle except beneath it. Just load an XYZ data file or a Matrix file, and perhaps define a few settings and you're ready to go.

FIGURE 7-1. 3DTV Interface



While you are viewing the data, you can use the movie tools to create a file that can later replay what you saw. In this way you can record the "points of interest" (or the entire survey) and review them at any time.

RUNNING THE 3DTV PROGRAM

1. **Launch 3DTV**. The program **launches** differently according to your chosen mode.
2. **Size your windows** (optional).
3. **Select the flight mode** in which you want to use 3DTV.

Function	Mode
Manipulate the camera manually	Free Flight mode
Simulate the view as you follow planned survey lines	Follow Path mode
Follow the vessel trajectory supplied by SURVEY	Attached to Vessel mode
Define and follow a circular path	Circle Flight

In Matrix 3DTV mode, only Free Flight and Attached to Vessel modes are available.

4. **Set your display options.** These include such things as your display method, and color and lighting settings.
5. **Use the camera controls** to set your view angles and move it across the project area.

6. **Use the movie tools** to make a record of what you see (Optional). This is not recording survey data. It creates a specialized file that can replay your view in 3DTV, but does not contain your survey data. You can record a 3DM file, which is saved to your project directory and can be used only for the purpose of replaying your movie in the 3DTV program. Alternatively, you can record it to an AVI file and replay it in a media player.
7. **Save your current settings** by selecting FILE-SAVE and providing a name. By default, 3DTV will save 3DTV mode information to the 3DV file in your project directory. The most recently used settings will be used the next time 3DTV or Matrix 3DTV is launched from the same HYPACK® project.

More Information

- "Launching the 3D Terrain Viewer" on page 7-282
- "Terrain Settings in 3DTV" on page 7-283
- "3D Terrain Viewer Flight Modes" on page 7-288
- "Display Options in the 3D Terrain Viewer" on page 7-291
- "Positioning your Camera in the 3D Terrain Viewer" on page 7-327
- "Saving your Views in the 3D Terrain Viewer" on page 7-339

MANAGING DISPLAY CONFIGURATIONS IN THE 3D TERRAIN VIEWER

There may be multiple display configurations which are frequently used by different people or for different purposes. Each window in 3DTV may be resized and repositioned on your screen so you can arrange your display to suit your needs and preferences.

Tool bars are typically docked at the top of the 3DTV window, but you may drag any number of them from there to any location you choose, even outside the 3DTV window. The camera controls are also free-standing and can be placed at any location.

NOTE: If you have arranged your tool bars across multiple monitors, and your monitor configuration changes from one work session to another, some of your tool bars may be out of view.

TIP: To easily 'retrieve' tool bars that are floating offscreen, select VIEW-TOOLBARS-BRING ALL TO CENTER.

You can also display selected project files and other survey features, and configure the display options for each feature represented.

3DTV provides an easy method to change between configurations without manually repositioning and resizing each window, or

reconfiguring survey feature displays every time. Simply save each configuration to a separate 3DV file and load their settings as needed.

For each configuration:

1. **Arrange your 3DTV windows and tool bars**.
2. **Select the survey features** to display.
3. **Set your display options**.
4. **Save the configuration to a 3DV file** by selecting FILE-SAVE PROJECT AS and naming the configuration.

Each time you launch 3DTV or Matrix 3DTV, the project's most recently used settings will be used.

To load alternate project settings, simply open the 3DV file where your settings are saved. Two menu options provide slightly different results.

- **FILE-OPEN:** For this option, you will also select the data set for your terrain model.
- **FILE-OPEN PROJECT SETTINGS:** This option maintains the current data set, but adopts the window configuration and other data-independent display settings from the selected 3DV.

More Information

- "Loading Survey Features to the 3DTV Display" on page 7-310
- "Display Options in the 3D Terrain Viewer" on page 7-291

LAUNCHING THE 3D TERRAIN VIEWER

To launch the program in 3DTV Mode:

- **From the main menu** select FINAL PROJECTS-3DTV. If you want 3DTV to automatically load the same data set next time (for all projects), select FILE-LOAD LAST DATA FILES.
- **From the SURVEY or DREDGEPACK® menu,** select OPTIONS-SHARED MEMORY-3DTV or MATRIX 3DTV.

The first time that you run the program in a project, it will ask you to select data and your choices for creating the model. 3D TERRAIN VIEWER models XYZ or MTX format files. You may select multiple files of the same type by holding the control key and selecting each with your cursor in the File Select dialog. Each file will be individually modeled and drawn in the Terrain windows. XYZ data is modeled according to the options set in the Terrain Settings dialog. Matrix data is modeled according to the grid size and rotation of the matrix.

To launch the program in Matrix 3DTV Mode .from the SURVEY or DREDGEPACK® menu, select OPTIONS-SHARED MEMORY-MATRIX 3DTV. Since the purpose of Matrix 3DTV mode is to update depth data in an existing matrix with current depth data, Matrix 3DTV

mode requires one or more matrix files to be enabled in your project. The program will create the terrain model based on the data in the enabled matrix.

In multibeam surveys you can use an empty matrix, and MATRIX 3DTV models the multibeam swath in real time.

In single beam surveys, it is best to use a filled matrix. MATRIX 3DTV can not create an accurate model from a single row of points, but it can update a complete model. If there is no existing data for your survey area, you can create a matrix filled with a uniform depth in the MATRIX EDITOR and update it with your survey data.

The first time Matrix 3DTV is started in a project, it will ask for:

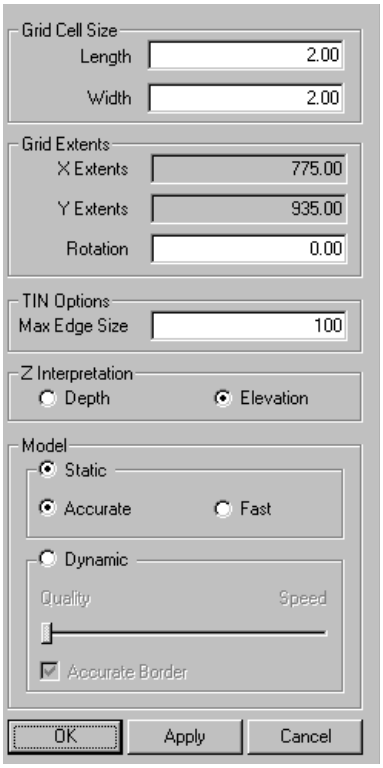
- Your **Terrain Setting** choices for creating the model. Otherwise, it will load the 3DTV settings that have been most recently used in the project.
- **Vessel Display Options**: Defined in the **Multiple Vessel Settings dialog**, these settings will be saved and automatically loaded next time you launch MATRIX 3DTV. You can access the same dialog by selecting VESSELS-SETTINGS if you want to modify your settings.
- **Size your windows (optional).** A new file will begin with default settings for your window sizing and position, visible toolbars, etc. A saved file will open with the settings that were active when it was last saved. WINDOWS-TILE automatically arranges your displays to provide optimum viewing. If you prefer a different arrangement, reposition and resize the windows to suit you and use the View menu to turn toolbars and the status bar on and off. If you want this arrangement to be the default, select FILE-SAVE DEFAULT.

TERRAIN SETTINGS IN 3DTV

When you are creating a new viewing, the 3D TERRAIN VIEWER will display the Terrain Settings dialog. The options in this dialog affect how your model will be created in your Terrain Windows.

NOTE The same dialog can be opened by selecting TERRAIN-SETTINGS. You may have to suspend shared memory updates, by selecting VIEW-SUSPEND UPDATES, to enable this option.

FIGURE 7-2. *Terrain Settings Dialog*



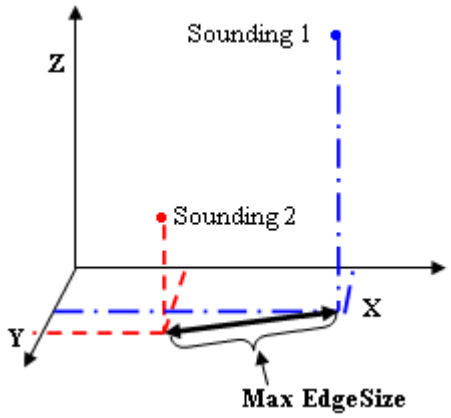
The **Grid Cell Size** defines width and height of the grid cell. The grid is used to detect camera-terrain collision conditions in both 3DTV and Matrix 3DTV modes and to affect change in the drawing rate and quality of the model in 3DTV mode only.

The **Grid Extents** are derived by the program from the data set and are for display purposes only.

The **Grid Rotation** enables you to turn the grid about the Y axis. A positive value rotates the grid clockwise. Rotating the grid to match the orientation of your data set may create a border that eliminates large empty areas and optimizing grid size to improve program performance. This option is disabled in Matrix 3DTV when the display adopts the orientation of the matrix file.

Max Edge Size is only required in 3DTV mode. It defines the longest distance between two horizontal plane projections of soundings that will be connected in the model.

FIGURE 7-3. Max Edge Size



You should set this large enough so your data points connect, but not so large that points which have little relationship connect to each other.

Z-Interpretation: This option generally reflects your Elevation Mode setting in your Geodetic Parameters and is disabled. In this case, it can only be changed in the GEODETIC PARAMETERS program.

Under certain specific conditions this option is enabled allowing you to choose whether your soundings should be interpreted as depths or elevations. The mode will be displayed in the dialogs and display windows that indicate a Z-level.

The scale of the Z-axis of your terrain, as well as other objects displayed in your terrain window, can be adjusted using the vertical exaggeration feature.

Model: Logically, larger data sets tend to slow the frame rate in the Terrain window. You can trade some of the quality of the model drawn for a faster drawing speed by selecting the appropriate model for your project. Experiment with these settings to see what works best with your computer and project needs.

The **Static** model does not change when camera moves. The model may be:

- **Accurate**, based on points from the imported file. This option draws the same type of detailed model that you may have seen in the TIN Model program—a Triangular Irregular Network
- **Fast**, that simplifies the terrain by drawing only one (center) point for each defined grid cell. This option creates the model based on the grid defined in the dialog—a TRN model (Triangular Regular Network) rather than a TIN model.

NOTE When a matrix file is loaded in 3DTV mode and the Accurate option is selected, the model looks like a TRN structure, although it is actually a TIN structure.

The **Dynamic** model is reconfigurable during camera motion. It always presents terrain areas closer to the camera in greater detail. When the camera moves, the terrain model changes to keep the refresh rate approximately constant.

When Dynamic mode is selected, you can further affect the speed and quality of your drawing by using the Quality/Speed slider.

- **Quality** will provide the most detailed presentation.
- **Speed** will produce very rough images of the area and a corresponding high frame rate.

The **Accurate Border** option maintains a constant border on the display of your terrain model. This option uses a lot of your CPU resources. Unless you have a super-powered computer, leave this option off.

The following figures demonstrate the differences. They are most evident in the wire frame models.

FIGURE 7-4. *Static Accurate Presentation*

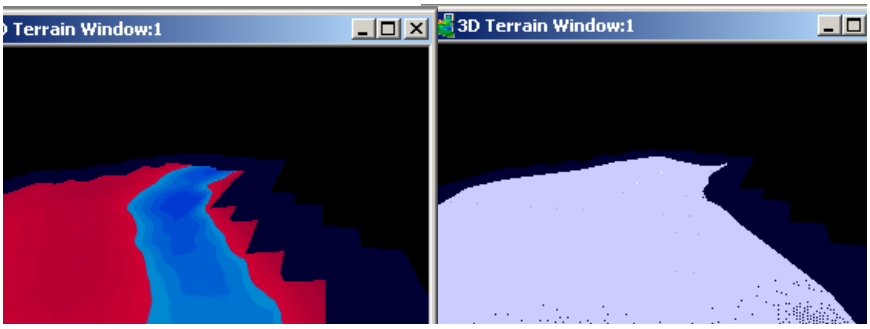


FIGURE 7-5. *Static Fast Presentation*

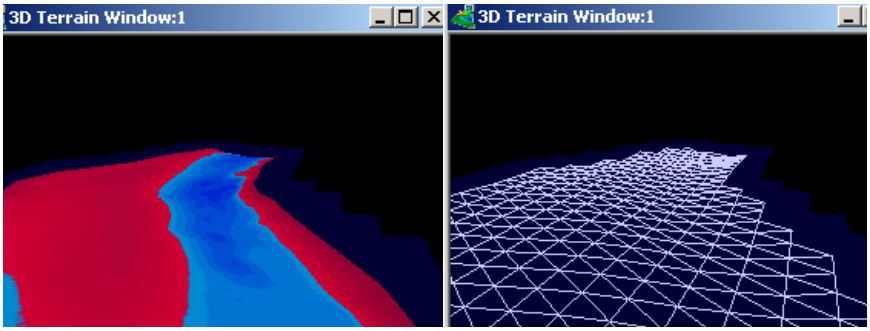


FIGURE 7-6. *Dynamic Quality Presentation*

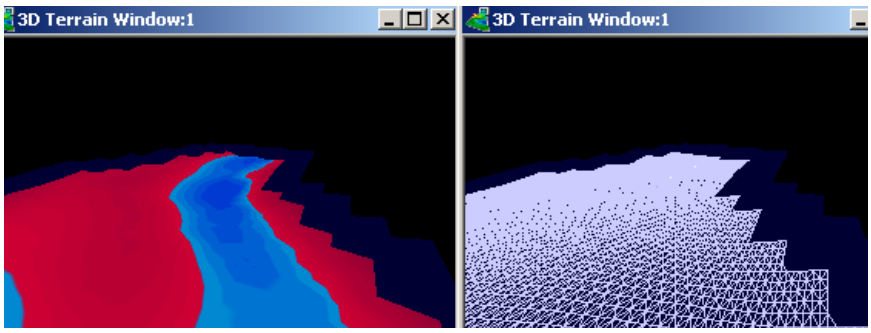
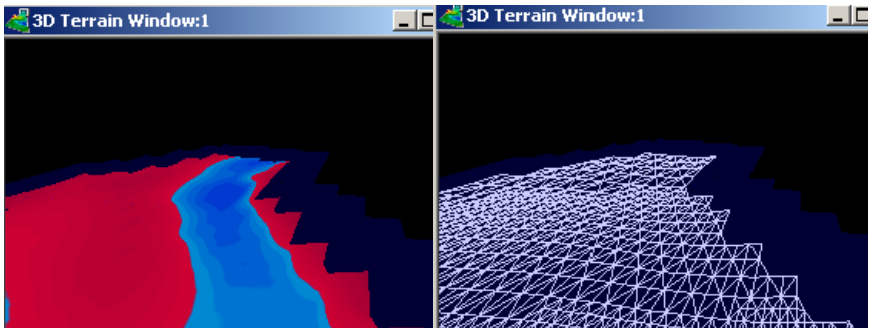


FIGURE 7-7. *Dynamic Speed Presentation*



In 3DTV Mode:

When *Static Fast* mode is selected, you can further affect the speed and quality of your drawing by adjusting the cell size. Larger cell dimensions generate less-detailed models, which can be drawn even more quickly by 3DTV.

NOTE Conversely, you can negate the effect of the Fast option by setting a small cell size.

All options mentioned above are available in the 3DTV program mode.

In Matrix 3DTV Mode:

The model is always drawn based on the cell size of the matrix that is currently loaded to SURVEY or DREDGEPACK. This means that the Cell Size in the Terrain Settings will have no effect on the model quality or drawing speed.

For the same reason, there is no difference between Static Accurate and Static Fast models in Matrix 3DTV mode. Therefore, the radio buttons Accurate and Fast will be disabled.

More Information

- "Vertical Exaggeration of the 3DTV Terrain Window" on page 7-304
- "3D Terrain Viewer Model Types" on page 7-291

CHANGING THE TERRAIN DATA SET IN 3D TERRAIN VIEWER

In 3DTV Mode, you can add and remove data sets that are modeled in your Terrain window at any time.

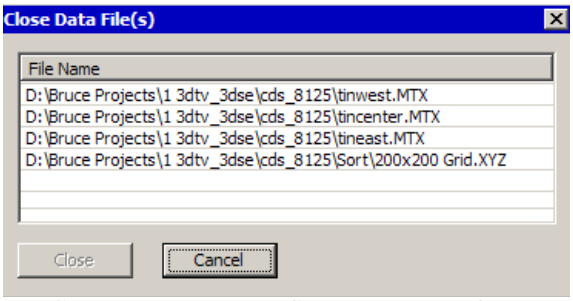
To add data to the display:

1. **Select FILE-APPEND DATA FILE(S)**.
2. **Choose the new XYZ or MTX data**.
3. **Define your terrain model settings**.

To remove data from the display:

1. **Select FILE-CLOSE DATA FILE(S).** A dialog will appear listing the data files currently modeled in your Terrain window.

FIGURE 7-8. *Close Data Files Dialog*



2. **Select one or more files to remove from the display.** You can select multiple individual files by holding the Ctrl key or multiple contiguous files by holding the Shift key while you select the files.
3. **Click [Close]**.

To clear all data and select a new set:

1. **Select FILE-CHANGE DATA FILE(S).**
2. **Choose the new XYZ or MTX data**.
3. **Define your terrain model settings**.

3D TERRAIN VIEWER FLIGHT MODES

The 3D Terrain Viewer can be run in four different modes. The mode is selected through the Flight Mode tool bar or through the CAMERA-FLIGHT MODE menu.

When you exit from 3DTV, the flight mode is recorded so it may be restored the next time you launch the program. In some cases, however, flight mode restoration will not be possible.

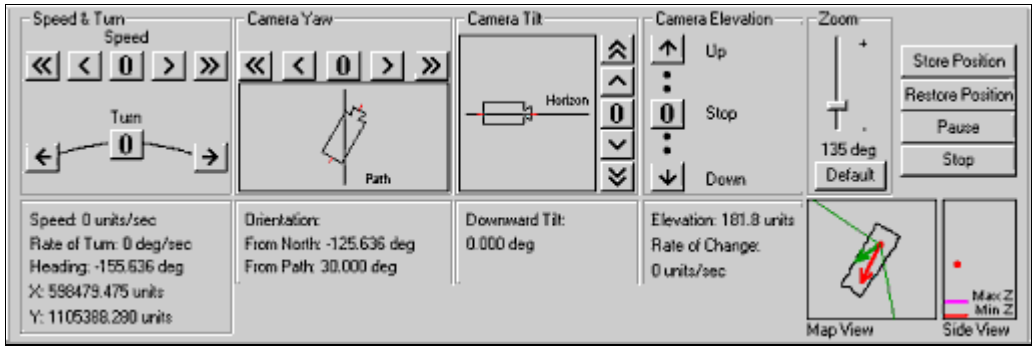
3DTV and Matrix 3DTV do not support all of the same flight modes. If the next time you open 3DTV in the project, you open it in the other operation mode, the previous flight mode can not be restored. In these cases, each operation mode will open in its default flight mode. 3DTV

will open in Free Flight mode, while Matrix 3DTV will open in Attached to Vessel mode.

FREE FLIGHT MODE

Free Flight Mode gives you full control to use the camera controls to view your data from almost any angle. In versions of 3DTV before 2.2, this was known as Manual Mode.

FIGURE 7-9. *Camera Controls-Free Flight Mode*



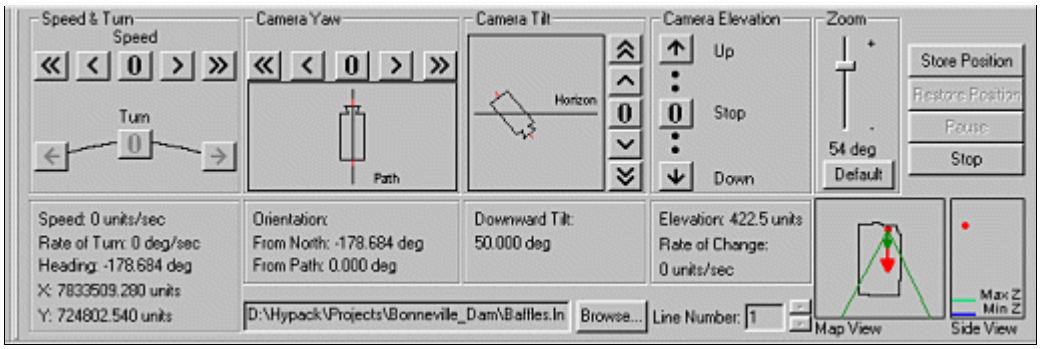
FOLLOW PATH MODE

Follow Path Mode asks you to load a Planned Line (LNW) file and automatically simulates travel down each survey line in the file. Since this mode follows the survey line, the Turn controls are disabled, while orientation controls (Yaw and Tilt) are enabled. This option is only available in 3DTV mode.

In this mode, additional options appear in the camera controls.

- The selected Planned Line file is displayed with a [Browse] so you can load a different line file.
- If the opened Planned Line file contains multiple lines, a control for line number selection will appear. Select the line number and the camera will be positioned at the start point of the line and directed by the first segment of the line.

FIGURE 7-10. *Camera Controls-Follow Path Mode*



- Camera Yaw, the angle relative to the line segment (path), will default to 0 degrees. At this setting, the program will automatically change the camera heading for each new line segment to follow the changed direction of the survey line. The camera yaw will remain the same relative to the line path when the line direction changes.

ATTACHED TO VESSEL MODE

Attached to Vessel Mode is used simultaneously with SURVEY or DREDGEPACK®. In 3DTV mode, it might be useful to review previously existing data as you tour the survey area, while in MATRIX 3DTV mode, you can watch the previous data being updated in real time as you survey. In versions of 3DTV before 2.2, this was known as Survey Mode.

- **If the vessel is not shown** (VESSEL-SHOW is not selected), the camera position and direction are taken from the Shared Memory created by the SURVEY program. It appears directly above the boat position and a Yaw setting of zero orients the camera to match the boat heading. Speed and Turn controls are disabled for this option as they are controlled by SURVEY. Camera orientation (Yaw and Tilt), zoom, and elevation change controls are enabled.
- **If the vessel is shown**, the camera is positioned relative to the vessel.

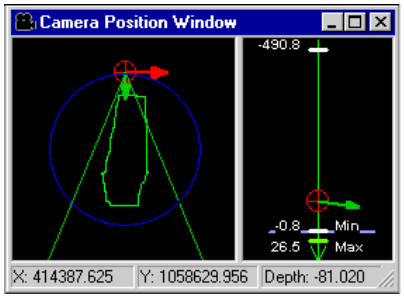
More Information

- "Viewing Boat Shapes in 3D Terrain Viewer" on page 7-318

CIRCLE FLIGHT MODE

Circle Flight Mode automatically creates a circular path sized to fit your loaded data set. The camera travels clockwise around the path at a speed set with the speed controls. Its yaw and tilt are fixed to point toward the center of the circle and slightly downward. This enables you to view your model or an object in the model from all sides (as if you were walking around it). This option is only available in 3DTV mode.

FIGURE 7-11. *Circle Flight Mode—the camera travels clockwise around a circular path.*



You can create a new path in the Camera Position Window. Just click where you want the center of the circle to be and drag a distance equaling the radius. Dotted lines will show the size and location of your new path until you release the mouse button and the path is created with the camera set at the point of release. When a new path is created, the speed will be reset to zero. If you are not happy with the results, try again.

DISPLAY OPTIONS IN THE 3D TERRAIN VIEWER

The 3D Terrain Viewer has several options affecting how you view your data. From within 3DTV, you can control the type of model created, the color scheme and lighting. You can also adjust the settings for the speed that the program can redraw the data in a window that has been repositioned or suspend display updates in 3DTV completely.

NOTE: The settings are applied to the active 3D Terrain Window, and that you can select different display modes for different 3D Terrain Windows.

3D TERRAIN VIEWER MODEL TYPES

3DTV provides a choice to view your data as a solid, color-coded model, a white wire frame model or with a geo-referenced TIF file draped over the surface.

The **solid and wire models** only require that you make your selection in the VIEW-DISPLAY METHOD menu.

For static, solid models you may also choose to display a smooth surface or a more angular one by selecting VIEW-DISPLAY METHOD-SMOOTH SURFACE.

FIGURE 7-12. *Solid Model*

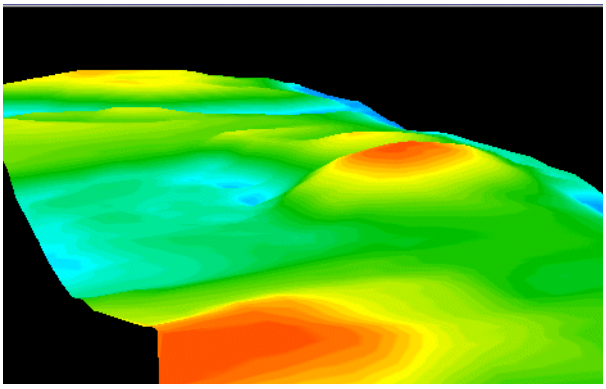


FIGURE 7-13. *Wire Frame Model*

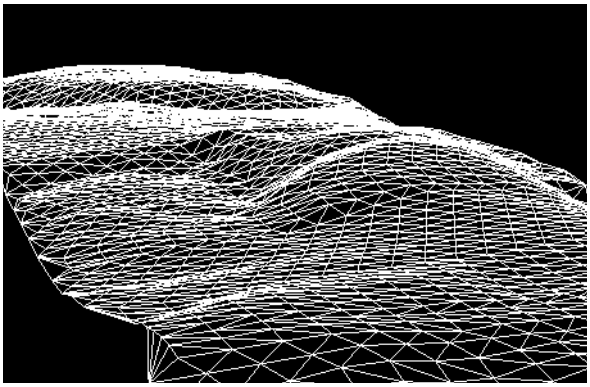
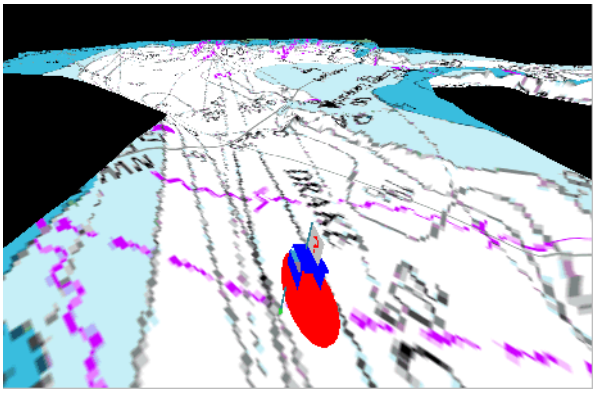


FIGURE 7-14. *Photo-Texture Models display TIF charts*

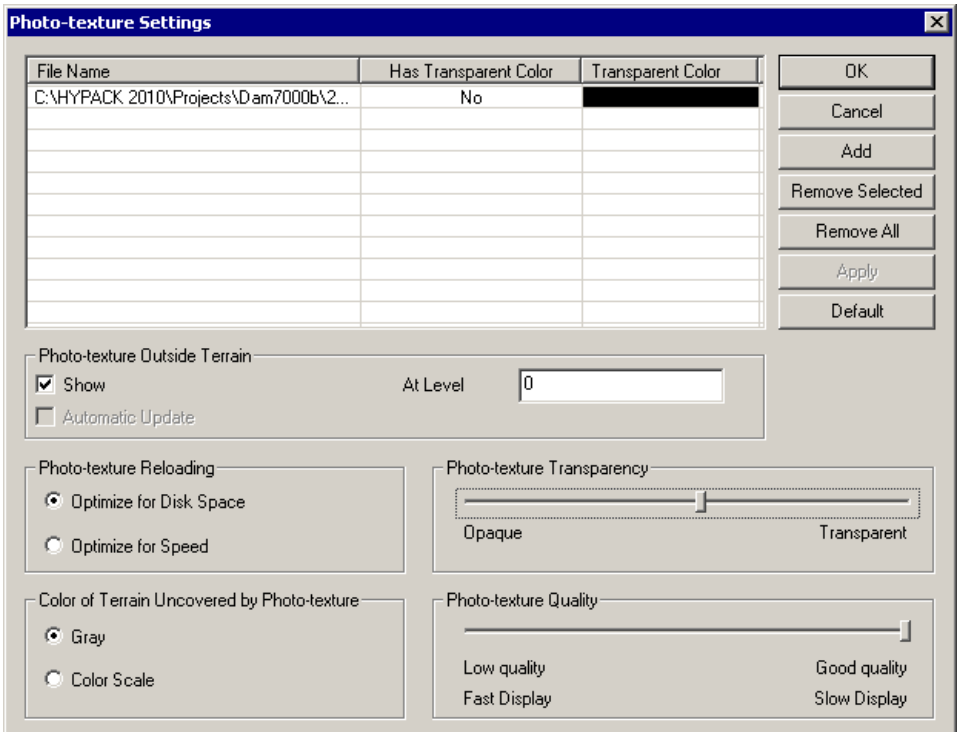


To display a TIF file draped over the surface, in the surrounding area or both is a two step process; you must first load one or more TIF files to your project before the photo-texture option is available.

To load your TIF files:

1. **Select TERRAIN-PHOTOTEXTURE SETTINGS** and the Photo-Texture Settings dialog will appear.

FIGURE 7-15. *Photo-Texture Settings Dialog*

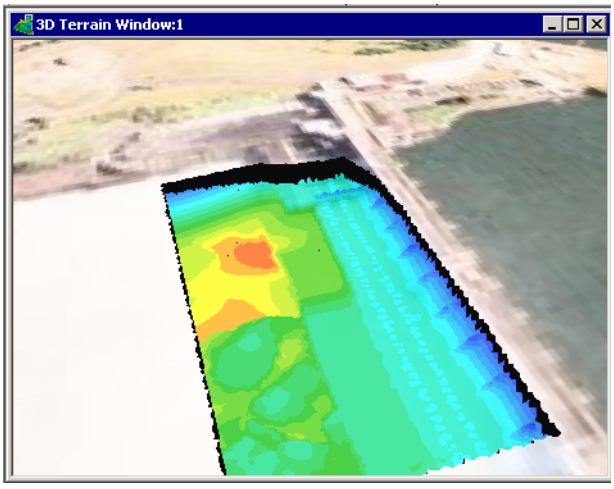


2. **Choose the TIF files** that you want to display.
   - **For each TIF file, click [Add]** and browse for your file. As each file is selected, it will be listed in the Photo-texture Settings dialog.
   - **If you change your mind**:
     - **Remove one file** by selecting it in the list and clicking [Remove Selected].
     - **Start over** by clicking [Remove All].
3. **Choose your photo-texture display settings** and click [OK].

NOTE: These settings apply to all photo-textures. They are not set for each layer independently.

- **Photo Texture Outside Terrain** options pertain only to geo-TIFs that extend beyond the range of the terrain data (XYZ or MTX) used to build your model.
  - **Show** tells the program to display portions of the TIF that extend beyond the terrain model.
  - **At Level:** The Z-level at which all TIFs are displayed. The space between the terrain level and this level where your TIF charts are drawn is filled in gray or the project colors for the depth.

FIGURE 7-16. *Difference in Z-level between the Geo-TIF and the Terrain Model Covered in black*

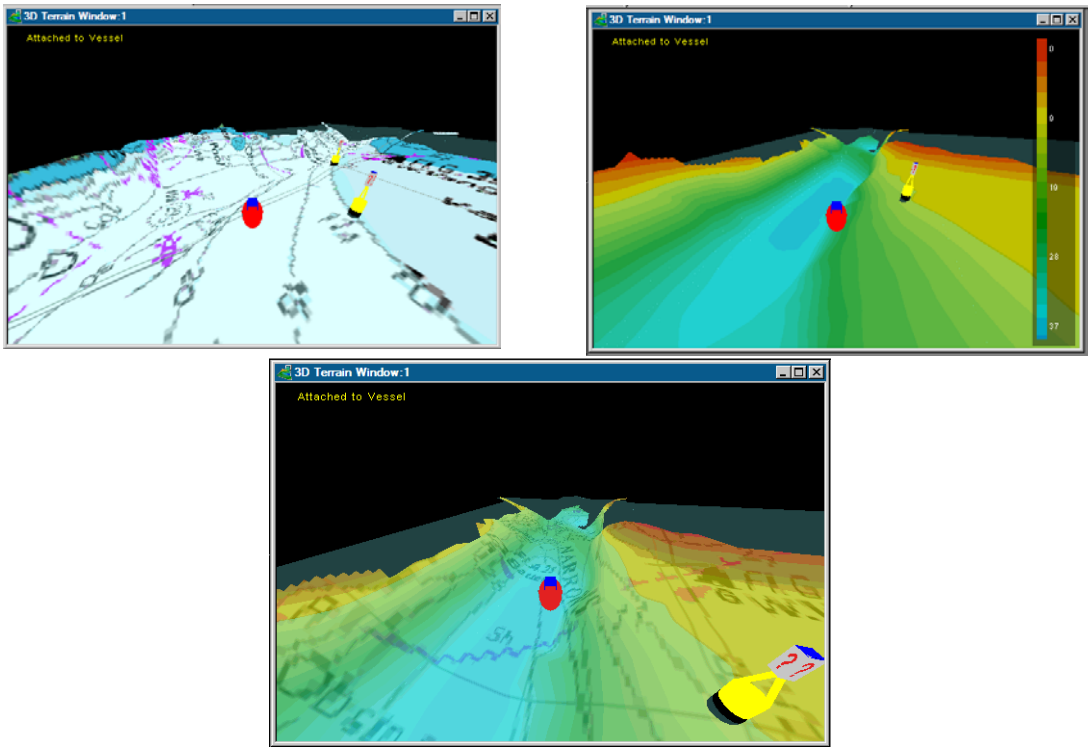


- **Automatic Update:** In Matrix 3DTV mode, the program constantly updates the terrain borders as 3DTV receives depth updates. Alternatively, you may leave this option unchecked and manually update the terrain as necessary.

NOTE: Photo textures outside the terrain model are supported only when the Accurate Border option is selected in the Terrain Settings.

- **Photo Texture Transparency:** In addition to the transparency color you can set the photo-texture to be partially transparent so that the matrix file over which the chart is superimposed can be seen. Use the"Photo-texture Transparency" slider in Photo-texture Settings dialog to adjust the level of chart transparency.
  - **Opaque**: The depth-colored model can not be seen through the texture.
  - **Transparent:** Only the depth-colored model is displayed.
  - All slider positions between will mix these two in the specified ratio.

FIGURE 7-17. *Sample displays.- Opaque (left), Transparent (right), Partial Transparency displays the color-coded TIN and the chart simultaneously (bottom)*



- **Transparent Color:** You can choose one color in your chart to become transparent in the display which allows the matrix to show through while the remaining areas of the TIF are fully opaque.

FIGURE 7-18. *A Transparent center-channel color of the S57 converted to Geo-tif allows the color-coded TIN surface to show through.*

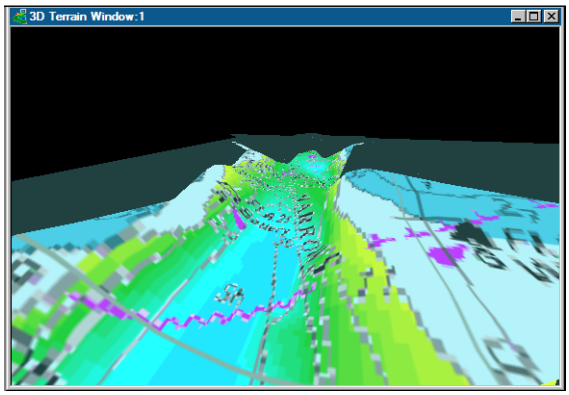
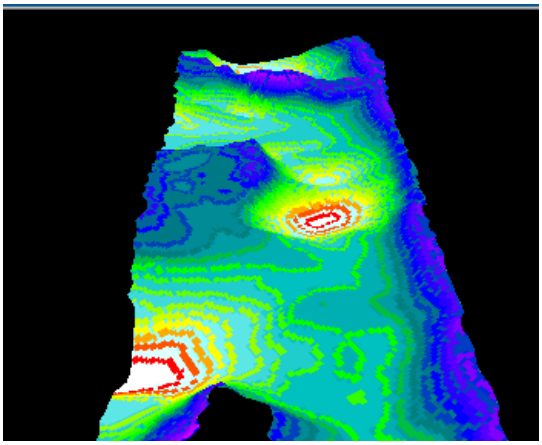


FIGURE 7-19. *2D Contours exported in Geo-Tif format from TIN MODEL. Project colors were changed and the TIF overlaid on 3DTV's color-coded model.*



NOTE: If the graphics hardware does not support texture mixing, this feature might be disabled and only plain photo-texture or plain depth-colored model can be displayed. This is unlikely with graphic adapters made after about 2002.

- **Photo Texture Reloading:** Creating a large photo-texture takes at least10 times longer than reloading a previously created texture from a file. As you can imagine, if your data file is very large, this could make a significant difference.
  If '**Optimize for Disk Space'** is selected, 3DTV will recreate the photo-texture each time you enter the program. '**Optimize for Speed**', saves the photo-texture in the project folder (to *GeoTiffFileName*.pho) ready to be reloaded without rebuilding it next time 3DTV is opened in the project. This photo-texture file is deleted when you select 'Optimize for Disk Space' again and save the project.

NOTE: The PHO file requires significant hard drive space.

- **Color of Terrain Uncovered by Photo-texture** determines what will be visible where your matrix or XYZ data extends beyond the edged of the TIF file. Choose to use gray or your project colors.
- **Photo-texture Quality** allows you to balance your needs for a quality display of your TIF with the drawing speed.

[Default] automatically selects gray terrain and the best quality display of your TIF files.

Once your TIF files are loaded, you can select the Photo-textured display method by selecting VIEW-DISPLAY METHOD-PHOTOTEXTURED.

More Information

- "Terrain Settings in 3DTV" on page 7-283
- "Manual Control of 3DTV Display Updates" on page 7-307

3D Terrain Viewer Color Settings

In each project, the first time 3D Terrain Viewer is opened from HYPACK®, it will begin with the HYPACK® color scheme. You can retain these colors or create a new set of colors for 3DTV.

A **color bar** may be displayed in the Terrain window so you can easily interpret the depths in your model. Select VIEW-COLOR BAR to toggle the color bar on and off. When you display the color bar with your custom colors, you can quickly access the color dialog by double clicking on the color bar.

To customize the sounding color settings:

1. **Select TERRAIN-COLOR SCALE-CUSTOM COLORS**.
2. **Select TERRAIN-COLOR SCALE-EDIT COLORS**. This displays the standard HYPACK® colors dialog for you to set your new color scheme.

NOTE: The custom colors only affect 3DTV. They are saved in the 3DTV project settings (and are restored when you later re-open the project *.3DV file), but they do not affect the project color settings outside of the 3DTV module.

To create multiple sets of custom colors for the same project:

Follow this procedure and save them to different 3DV files. If your desired settings are not in the most recently used project file (3DTV_Project.3DV for 3DTV or DV_Project.3DV for MATRIX 3DTV, which will be read when the program starts, use OPEN-FILE to select the appropriate 3DV file.

You can toggle between HYPACK® and Custom Colors by changing your TERRAIN-COLOR SCALE menu selection at any time.

You can also choose the background color for your display through the VIEW-BACKGROUND COLOR menu item. From here you can elect to display black or white, or set another color.

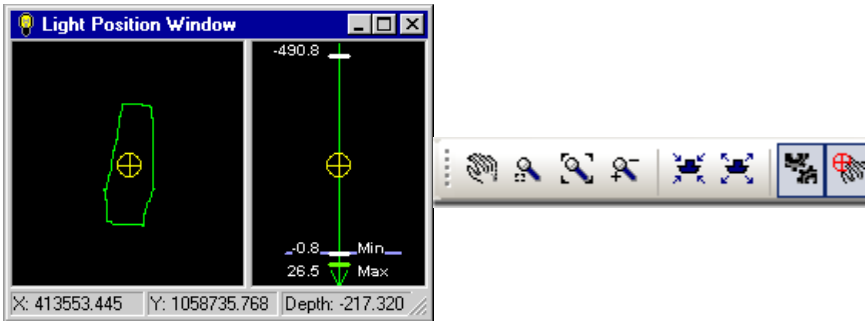
To choose a background color:

1. **Select VIEW-BACKGROUND COLOR-USER DEFINED**.
2. **Select VIEW-BACKGROUND COLOR-EDIT BACKGROUND.** A color dialog will appear for you to select the new color.
3. **Click [OK]** to return to 3DTVand apply the selected color. This will be the background color whenever you choose the 'User-defined' option until you choose another color.

LIGHTING IN 3DTV

There is one light source available for each incident of the 3D Terrain Window. The light settings are independent in each window. Changes made in the Light Position Window will be applied to the currently selected 3D Terrain Window. All models are affected by the lighting.

FIGURE 7-20. *Light Position Window (left) Map View Tool Bar (right)*



To adjust the display in the map view, place the focus on the Light Position window and use the tools in the map view tool bar. The unusual functions work as follows:

- **Zoom in Vessel** and **Zoom out Vessel** position the vessel in the center, then zoom in or out. The effect is as the map view is translated to position the vessel in the center, and then is left/right mouse clicked on the vessel origin, when Zoom In/Out is switched on. Zoom in Vessel and Zoom out Vessel are disabled when the vessel is not available.
- **Synchronized Zoom** keeps synchronization between zoom in Camera Position Window and Light Position Window, applying and forwarding zoom commands from the active window to the other one.

POSITIONING THE LIGHT SOURCE

You can position the light source manually or automatically.

- **Manually,** in **Light Position Window.** (If the Light Position Window is not visible, select LIGHTING-POSITION WINDOW.)
  - **Adjust the horizontal position of the light source** on the left side of the window where an aerial view of your data file and a yellow circle that represents the light source are displayed. Click where you want your light source relative to your data and the circle will move to that location. The effect will be seen in the 3D Terrain window.
  - **Adjust the vertical position of the light source** on the right side of the window where the minimum and maximum Z-values of your data file are displayed. Click in that window at the level relative to the data where you want the light. The yellow circle will move to that location and the effect will be seen in the 3D Terrain window.

- **Automatically by synchronizing the light position with the camera position** using the Mining Lamp feature. Select LIGHTING-MINING LAMP (or enable the *Mining Lamp Mode* icon.)

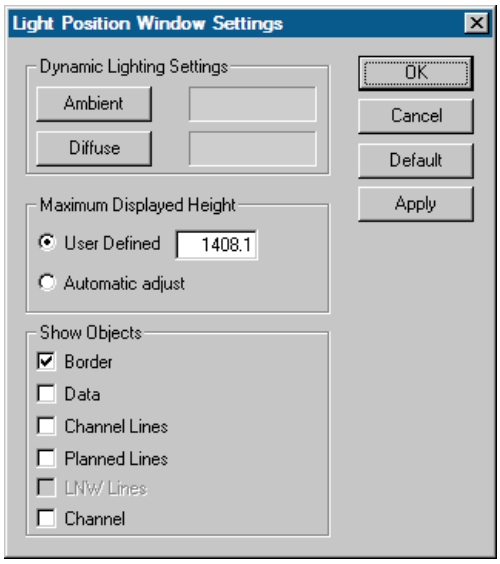
NOTE: When the feature is selected, you can not adjust the light's horizontal position manually.

DYNAMIC LIGHTING SETTINGS

The **Dynamic Lighting** settings adjust the lighting in the 3D Terrain Viewer. Select LIGHTING-ENABLE to toggle this feature on and off.

To select your dynamic lighting settings, select LIGHTING-SETTINGS and the Dynamic Lighting Settings dialog will appear.

FIGURE 7-21. *Dynamic Lighting Settings Dialog*



Ambient light comes from "everywhere".

Diffuse light originates from the light source, which is precisely positioned in space.

To customize the color of each type of light click the corresponding button and select your color from the color selection dialog that appears.

NOTE: You are free to select any color. However, keep in mind that only the white light (or shades of gray, which represent the white light of lower intensity) would not affect colors of the solid model.

The **Maximum Displayed Height** is the vertical extent of the side view of the Light Position Window. It can be set

- At a **user-defined** constant by entering a level here. This value may not be less than the default value which is calculated based on the current dataset. (Click [Default] to find out what that value is.)

NOTE: The Maximum Displayed Height setting does not limit the level of the lighting source, but if the lamp level exceeds the user-defined level, it will not be visible in the Light Position Window.

- **Automatically** by the program. The Automatic Adjust option adjusts the Maximum Displayed Height based on the current light position. If your light position is near the top of the current range, the Maximum Displayed Height will increase; if the light is near the lower end of the range, the Maximum Displayed Height will decrease.

The **Show Objects** options determine what is shown in the left side of the Light Position window in addition to the light symbol. You may choose to display a filled, color-coded representation, or only an outline of your data files (or both). When channel information or planned lines have been imported to your Terrain window, you may also display them in the Light Position window by checking their corresponding checkbox in this dialog.

SKY DISPLAYS IN 3DTV

In addition to your project data and project files,the 3D TERRAIN VIEWER provides a selection of options that affect the sky displays.

- **Sky** is a static sky display. In configuring your skyscape, the sky setting would typically be used alone or as a backdrop for added clouds and fog.
- **Clouds** draws three, individually configured cloud displays representing low, medium and high altitude clouds.
- **Fog** draws clouds just above ground level.

3DTV SKY BACKDROP

In addition to your project data and project files, you can include an image representing the sky in your Terrain window display. 3D TERRAIN VIEWER provides several images representing different lighting and weather conditions.

To display a skyscape select NATURE-SKY and the type of sky you wish to display. A bullet will appear next to the selected option and the sky image will be drawn to the Terrain window.

NOTE: Drawing the sky image initially may take several seconds. The status bar indicates the progress of this process.

FIGURE 7-22. *Day Fair Skyscape*

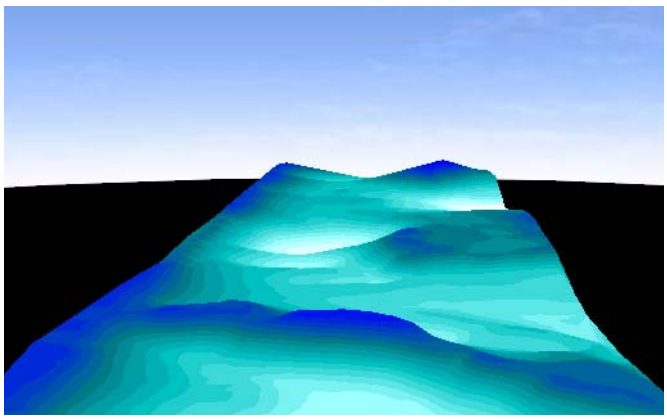
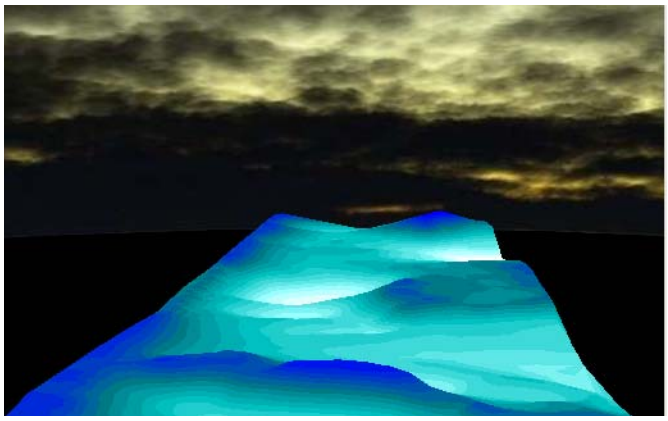


FIGURE 7-23. *Dusk Overcast Skyscape*



To remove the sky from your display, select NATURE-SKY-NONE.

3DTV CLOUDS

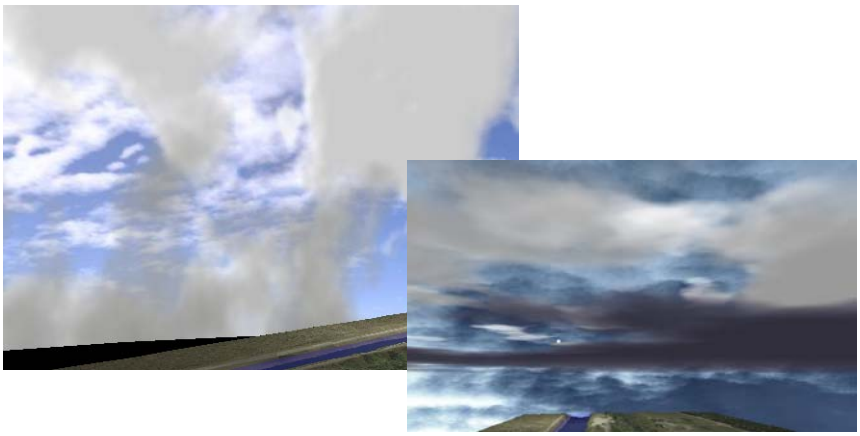
Clouds are drawn in three layers to represent clouds at high, medium and low altitude. They would typically be overlaid on a sky display.

Displaying Clouds in the Terrain Window:

Select NATURE-CLOUDS-SHOW and indicate layers you want to display.

- **All** and **None**: With one selection, turn all three layers on and off respectively.
- **High , Medium and Low Altitude Layer** options toggle each layer individually.

FIGURE 7-24. *Sample Cloud Displays*

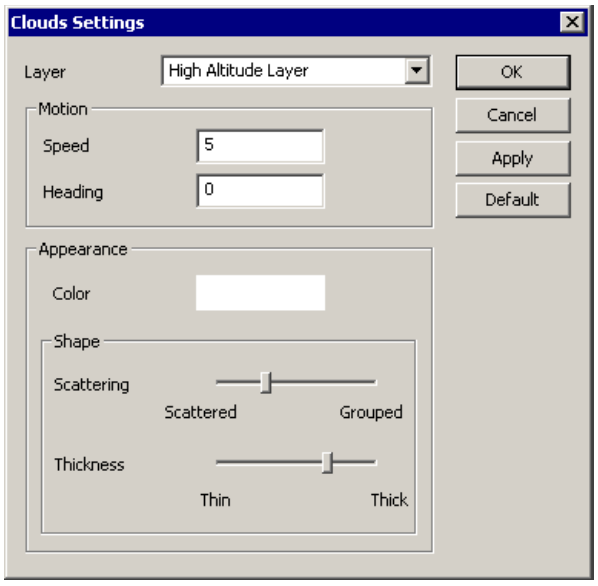


Configuring the Cloud Display:

Each cloud layer is independently configured with motion and appearance settings in the Cloud Settings dialog.

1. **Access the Cloud Settings dialog** by selecting NATURE-CLOUDS-SETTINGS.

FIGURE 7-25. *Cloud Settings*



2. **For each layer, do the following**:
   a. **Select the layer to configure** in the Layer drop-down list.
   b. **Enter your parameters and click [Apply]**.
      - **Motion settings** determine the speed and direction the clouds will travel.
      - **Color**: Click the colored square and choose the color.
      - **Scattering** determines how isolated or clustered the clouds are.

- **Thickness** determines how opaque and distinctly formed the clouds will be.

NOTE: If either the Scattering or Thickness slider is positioned at the far left, there will be no clouds.

c. **Preview the results** in the Terrain window.

3. **When all layers are satisfactorily configured, click [OK]** to close the dialog.

3DTV FOG

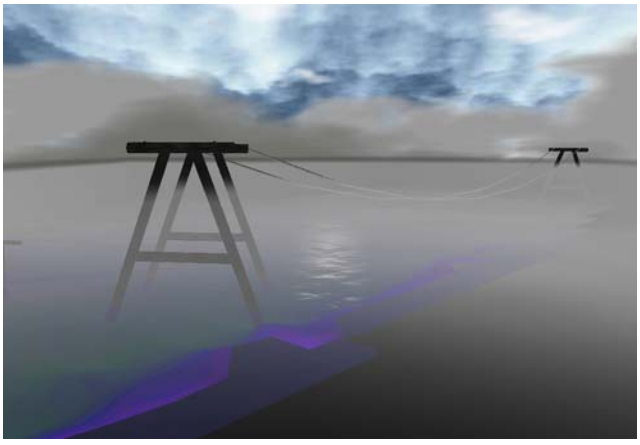
Fog would typically be overlaid on a Sky backdrop to further mimic possible environmental conditions.

Your computer must meet certain requirements to draw fog.

Displaying fog:

To display fog, select NATURE-FOG-SHOW.

FIGURE 7-26. *Fog Display in 3DTV*

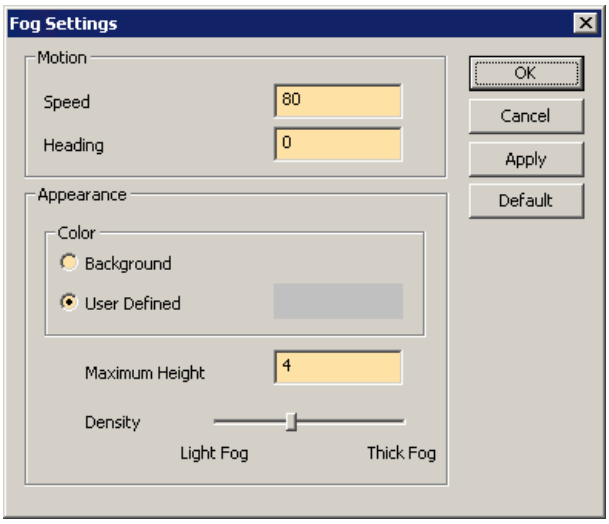


You can configure motion and appearance of the fog through the Fog Settings dialog.

Configuring the Fog Display:

1. **Access the Fog Settings dialog** by selecting NATURE-FOG-SETTINGS.

FIGURE 7-27. *Fog Settings Dialog*



2. **Enter your parameters and click [Apply]**.
   - **Motion settings** determine the speed and direction the fog can travel.
   - **Color**: Click the colored square and choose the color.
   - Maximum Height
   - **Density:** Choose light to think fog, keeping in mind that fog density will increase with distance from the camera.
3. **Preview the results** in the Terrain window.
4. **Click [OK]** to close the dialog.

VERTICAL EXAGGERATION OF THE 3DTV TERRAIN WINDOW

The scale of the Z-axis of your terrain, as well as other objects displayed in your Terrain Window, can be adjusted using the Vertical Exaggeration feature. The water level and channel will also be scaled by the same factor in order to keep the scale of the entire display synchronized. This can be particularly helpful if your terrain is nearly flat.

To accentuate changes in depth or elevation: Multiply the Z-scale by a factor larger than 1.

To flatten the terrain: Enter a value between 0 and 1.

To set the Z-scale:

- **Click and drag the slider on the Vertical Exaggeration Toolbar**. The current Z-scale is displayed on the left end of the toolbar.
- **Select VIEW-VERTICAL EXAGGERATION and enter a Z-scale factor** in the Vertical Exaggeration dialog.

FIGURE 7-28. Vertical Exaggeration Dialog

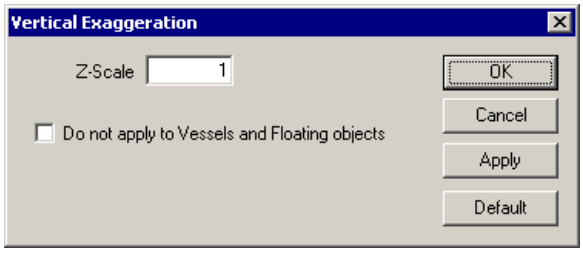
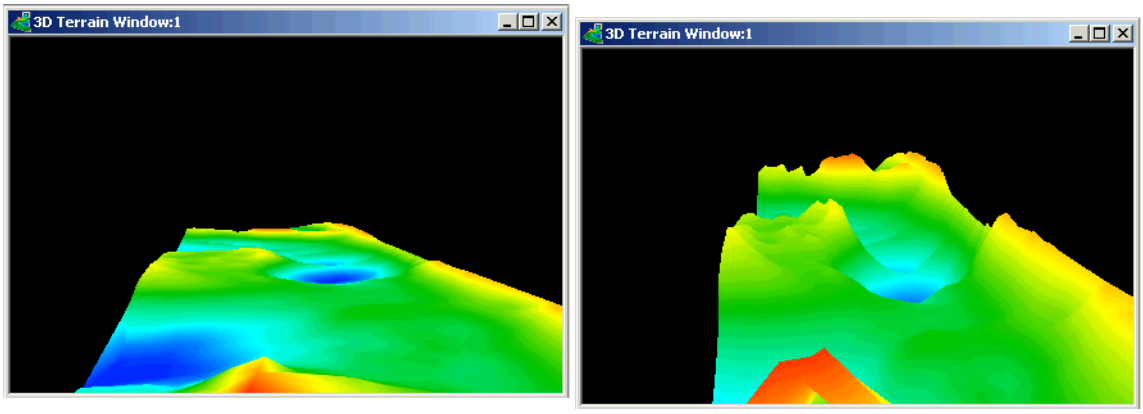


FIGURE 7-29. Scale Factor=1 (left), Scale Factor=5 (Right)



The **Do not apply to Vessels** checkbox allows you to exaggerate the features in your survey area without distorting the proportions of your boat shapes and floating objects.

To quickly return your Z-scale to one

Click the [->1<-] button on the toolbar.

FIGURE 7-30. Tool Bar

FULL SCREEN MODE IN 3DTV

Full Screen Mode displays only the contents of the currently active Terrain window. In this mode, no other windows or controls in the graphic interface are available.

To enter Full Screen mode:

- Select VIEW-FULL SCREEN
- Click the full screen mode icon on the Accessories Toolbar.

NOTE: The Full Screen feature is disabled during AVI recording.

To leave the Full Screen mode:

Press the ESC key.

While in Full Screen mode, all of the keyboard commands and mouse controls are still available. On screen cues (F2) are provided for your reference.

There are two interaction modes using mouse controls in Full Screen mode. Use F3 to toggle between the two modes.

- **Anchor Mode** controls may also be used when you are not in Full Screen mode.

TABLE 7-1. *Controlling the Camera with your Mouse in Anchor Mode*

Mouse Action	Result
Click + drag	Shifts the camera position horizontally in a manner such that it appears the terrain model moves in the direction of the cursor motion.
Ctrl + Click and drag	• Drag mouse forward and back shifts the camera position horizontally and vertically, and adjusts its height and tilt in a manner such that it appears the terrain model rotates around the Y-axis of the display at the cursor position. (This is only the same as the Y-axis of the projection if the camera heading is zero.). • Drag mouse left and right shifts the camera position horizontally, and adjusts its tilt and heading such that it appears the terrain is rotating around the cursor position.
Click + scroll (with the mouse wheel)	Changes camera distance from the selected point on the terrain. This operation shifts both the horizontal and vertical positions in a manner that maintains the current camera tilt. **NOTE:** This control is limited to Free Flight mode when at least a portion of the terrain is visible.

TABLE 7-2. *Controlling the Camera with your Mouse in Anchor Mode*

Mouse Action	Result
Click + drag	Shifts the camera position horizontally in a manner such that it appears the terrain model moves in the direction of the cursor motion.
Ctrl + Click and drag	• Drag mouse forward and back shifts the camera position horizontally and vertically, and adjusts its height and tilt in a manner such that it appears the terrain model rotates around the Y-axis of the display at the cursor position. (This is only the same as the Y-axis of the projection if the camera heading is zero.). • Drag mouse left and right shifts the camera position horizontally, and adjusts its tilt and heading such that it appears the terrain is rotating around the cursor position.
Click + scroll (with the mouse wheel)	Changes camera distance from the selected point on the terrain. This operation shifts both the horizontal and vertical positions in a manner that maintains the current camera tilt. **NOTE:** This control is limited to Free Flight mode when at least a portion of the terrain is visible.

TABLE 7-3.

- **Sliding Mode** controls were developed in the earlier versions of 3DTV.

TABLE 7-4. *Controlling the Camera with your Mouse in Sliding Mode*

Mouse Actions	Result
Click and drag	Affects Camera Yaw and Tilt.
Right-click and drag forward/back	Terrain moves forward/back
Ctrl + Right-click and drag forward/back	Terrain moves up/down

More Information

- “Keyboard Shortcut Commands” on page 7-332

MANUAL CONTROL OF 3DTV DISPLAY UPDATES

If you are running MATRIX 3DTV while you are logging data, you may find that the demand of 3DTV on your CPU resources is affecting the

performance of other programs you are running. The power of your computer and your program options, in 3DTV as well as in other programs, all contribute to your system performance.

If your system is temporarily over-taxed, you can suspend the display updates in 3DTV. VIEW-SUSPEND UPDATES tells 3DTV to temporarily ignore new data from shared memory. All vessels will stop moving and the model will not be updated. This option helps free your CPU resources to make them available while you are changing your settings in 3DTV. If you are logging data in SURVEY or DREDGEPACK® while in MATRIX 3DTV, *it will not affect your data collection*; only the 3DTV display is affected.

While your updates are suspended, you can manually update the model by selecting VIEW-REFRESH or by clicking the Refresh icon.

TIP: If you want to suspend 3DTV activity for longer periods, particularly if you are logging data, you should refresh your display regularly or close 3DTV until you are ready to use it again. This will assure that your display is always current and that you are using your CPU resources to your best advantage.

More Information

- "Terrain Settings in 3DTV" on page 7-283
- "Optimizing 3D Terrain Viewer Performance" on page 7-342

CAMERA POSITION WINDOW SETTINGS

The Camera Position window display can be configured using the Camera Position Window Settings dialog where there are options to set the vertical range of the window and to display imported objects.

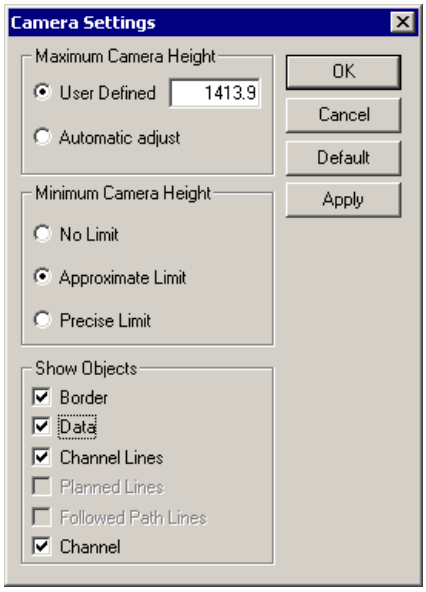
To adjust the display in the map view:

- **Place the focus on the Camera Position Window and use the tools in the map view tool bar.** The unusual functions work as follows:
  - **Zoom in Vessel** and **Zoom out Vessel** position the vessel in the center, then zoom in or out. The effect is as the map view is translated to position the vessel in the center, and then is left/right mouse clicked on the vessel origin, when Zoom In/Out is switched on. Zoom in Vessel and Zoom out Vessel are disabled when the vessel is not available.
  - **Synchronized Zoom** keeps synchronization between zoom in Camera Position Window and Light Position Window, applying and forwarding zoom commands from the active window to the other one.

Use the Camera Position Window Settings Dialog

Select CAMERA-POSITION WINDOW SETTINGS to access the Camera Position Window Settings dialog.

FIGURE 7-31. *Camera Settings Dialog*



The **Maximum Camera Height** in the Camera Position Window can be set to a constant level or to automatically adjust according to the height at which you set the camera.

To set the Maximum Camera Height:

- **At a constant, user-defined level**, select the **User-Defined** option and enter the level. This value may not be less than the default value which is calculated based on the current data set. (To find out what that value is, click [Default].)
- **Automatically** by the program. The **Automatic Adjust** option adjusts the Maximum Camera Height based on the current camera position. If your camera position is near the top of the current range, the Maximum Camera Height will increase; if the camera is near the lower end of the range, the Maximum Camera Height will decrease.

To set the Minimum Camera Height:

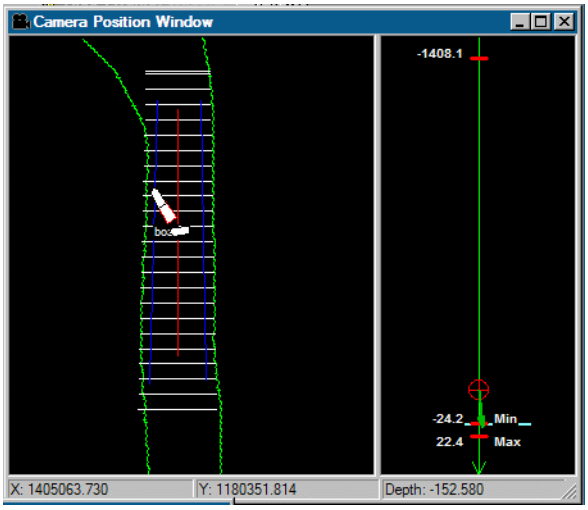
The **Minimum Camera Height** sets the lowest camera position.

- **No Limit**: The camera may even go beneath terrain surface.
- **Approximate Limit**: The camera will go only as low as the maximum height in the model cell below it.
- **Precise Limit:** The camera will go only as low as the maximum height point in the entire model below it. This option may slow-down frame rate as it requires more calculation.

The **Show Objects** options determine what is shown in the left side of the Camera Position window in addition to the camera symbol. You may choose to display a filled, color-coded representation, or only an outline of your data files (or both). When channel information or planned lines have been imported to your Terrain window, you may also display them in

the Camera Position window by checking their corresponding checkbox in this dialog.

FIGURE 7-32. *Camera Position Window displays the Data Border, Boat, Channel Lines and Planned Lines*



Border draws a green outline of your terrain model.

Data draws a 2-dimensional, color, solid representation of your data.

Channel Lines draws the center line and toe lines if you have imported a Channel Plan file (*.PLN).

Planned Lines draws the survey lines if you have imported a Planned Line file (*.LNW).

Followed Path Lines draws the survey lines the vessel is following in 'Follow Path' mode. This option is only available in Follow Path mode.

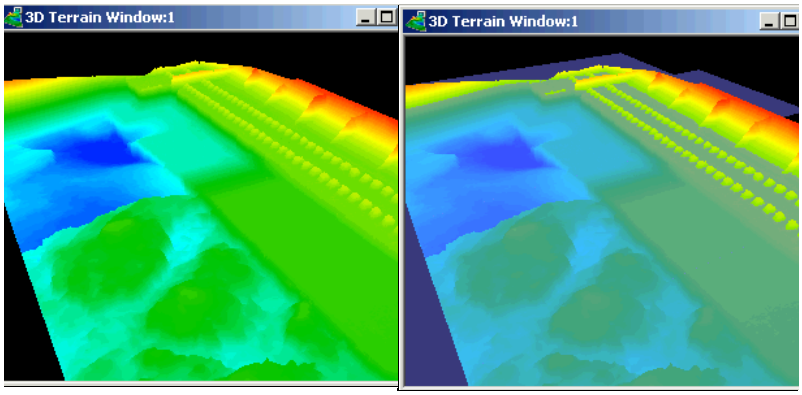
Channel draws a white outline of the channel area if you have imported a Channel File (*.CHN).

LOADING SURVEY FEATURES TO THE 3DTV DISPLAY

VIEWING A WATER SURFACE IN 3DTV

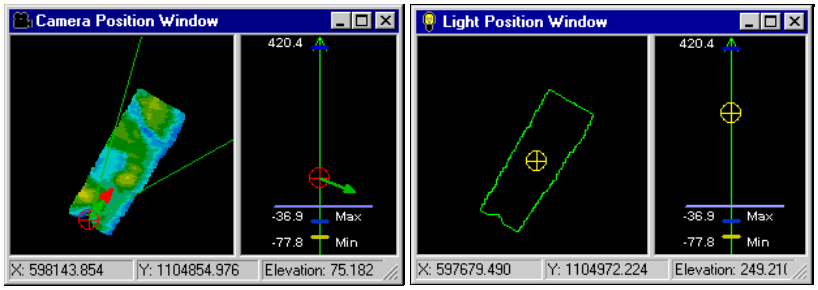
You can improve the realism of the display by superimposing a water surface in your survey area. To do this, select NATURE-WATER SURFACE and check *Enable*.

FIGURE 7-33. *Survey Data displayed in 3DTV--*
No Water Surface(left), Water Surface Enabled (right)



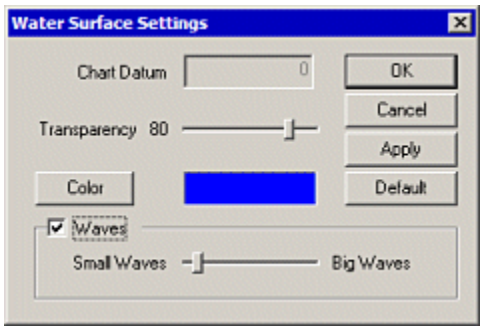
The Water Surface Level is also drawn in the Camera and Light Position Windows. In the following figures, the water level is represented by the line in the selected water color on the right side of the window.

FIGURE 7-34. *The Water Level is drawn in the Camera and Light Position Windows*



The water's level, transparency and color are controlled through the Water Surface Settings dialog. Select OBJECTS-WATER SURFACE-SETTINGS and the dialog will appear.

FIGURE 7-35. *Water Surface Settings--Default Settings*



The **Chart Datum Level** is the height of the chart datum above Mean Sea Level. It is read from your geodesy settings.

NOTE: If the control is enabled, the geodesy settings do not contain the value, so set it to the desired level. This Z value will be interpreted

as elevation, regardless of Z-interpretation mode, since all displayed Z-values in the 3DV are elevations.

The Water Surface Level is determined by the Chart Datum Level and, in Attached to Vessel Flight Mode, the Tide Correction value which is read from shared memory.

Transparency affects the transparency of the water surface. A value of zero results in an opaque surface while 100 causes it to become invisible.

[Color] displays a color dialog from which you can choose a color for the water in your display. Note that, unless you choose white, the color of the water will affect the color display of the depths below water level.

The **Waves** option overlays a wave-like texture on the water surface. When this option is checked the corresponding slide sets the degree of wave action.

NOTE: This option is only supported by certain video cards. At this writing, Invidia cards support waves. ATI graphics cards do not.

[Apply] updates the 3DTV window according to your settings without leaving the settings dialog.

[Default] resets the values to CDL = the value defined in the geodesy settings (or 0.0), Transparency = 80 and the Color to blue.

VIEWING PLANNED LINES AND CHANNEL INFORMATION IN 3DTV

You can display planned lines and channel information in your Terrain window as well as in the Camera and Light Position windows. Such information provides the helmsman with important information to guide his navigation and improve digging accuracy.

The channel file can contain either depth or elevation data. The information on the expected Z-interpretation of channel file data will be read directly from the channel file or, if the mode is not indicated there, the mode will be set to match the Z-interpretation selection in the program.

IMPORTING PLANNED LINES AND CHANNEL INFORMATION TO 3DTV

Load your choice of files by selecting OBJECTS-CHANNEL-IMPORT and the file type you want to view then choose your file from the file selection dialog that appears. 3DTV accepts:

Feature	Source
Channel	CHN files are Channel Plan files created in ADVANCED CHANNEL DESIGN.
Channel Lines	PLN files are Channel Plan files created in CHANNEL DESIGN. They include Toe Lines, Center Lines and Basin Lines.
Planned Lines	LNW files are created primarily in the LINE EDITOR or in CHANNEL DESIGN.

Planned lines will be displayed with their line name above each end.

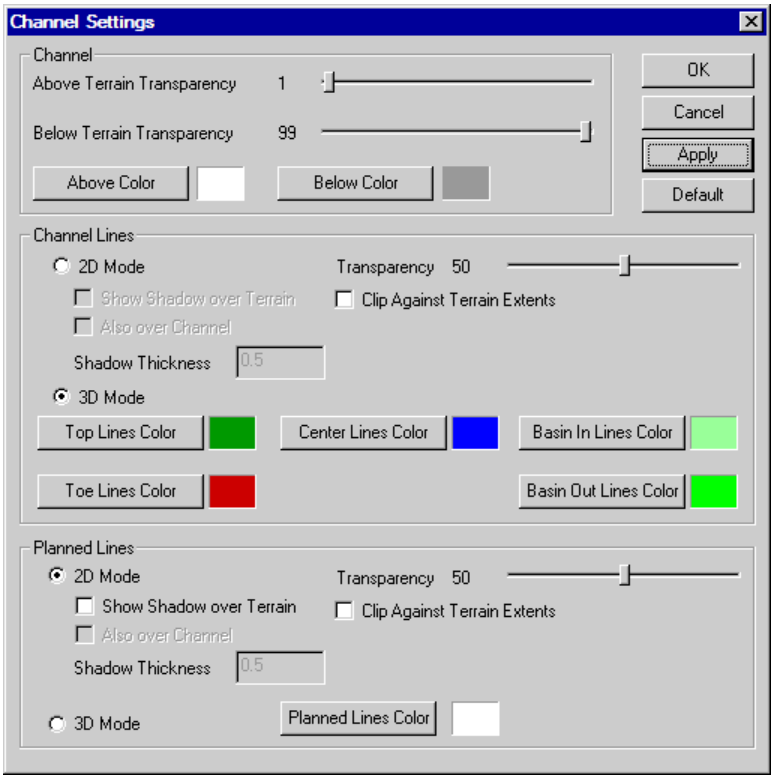
NOTE: If you want to display channel lines with the planned lines, you would typically create the LNW file and PLN files both at the same time in CHANNEL DESIGN.

DISPLAY OPTIONS FOR PLANNED LINES AND CHANNEL INFORMATION IN 3DTV

Once you have loaded your choice of features, you can customize how they are displayed.

The **Terrain window display** is controlled through the Channel Settings dialog which can be accessed by selecting OBJECTS-CHANNEL-SETTINGS. Take a little time to experiment with the different settings and you will quickly understand how they work and develop preferences for your purposes.

FIGURE 7-36. *Channel Settings Dialog*



You can customize the properties of each type of feature as follows:

Color: Click the button corresponding to the feature color that you want to modify. A color selection dialog will appear for you to choose your new color. The current color is displayed next to the button that modifies it. Notice that you can choose separate settings for the toe lines, center lines and turning basin lines, as well as the portion of the Channel file that falls above and below the model created from the survey data.

Transparency: Use the sliders to change the percentage of transparency when the feature is displayed in 3 dimensions. 100% transparency is invisible, while 0% transparency is opaque. Again, you can choose separate settings for the portion of the Channel file that falls above and below the model created from the survey data.

Dimensions: Channels, by definition, can only be displayed in 3 dimensions. Channel Lines and Planned Lines can be drawn in 2 or 3 dimensions. When Channel or Planned Lines are drawn in 2 dimensions, additional options are enabled that allow you to project the lines' shadows directly below the object.

- **Show Shadow Over Terrain** shows the shadow against the terrain. If a channel (CHN) is being displayed and is above terrain level, the shadow will not show.
- **Also Over Channel** always displays the shadow over the project area.

Shadow Thickness sets the weight of the shadows when they are displayed against the terrain or channel.

FIGURE 7-37. *2D Channel Lines + Shadow (left), 3D channel Lines (right)*

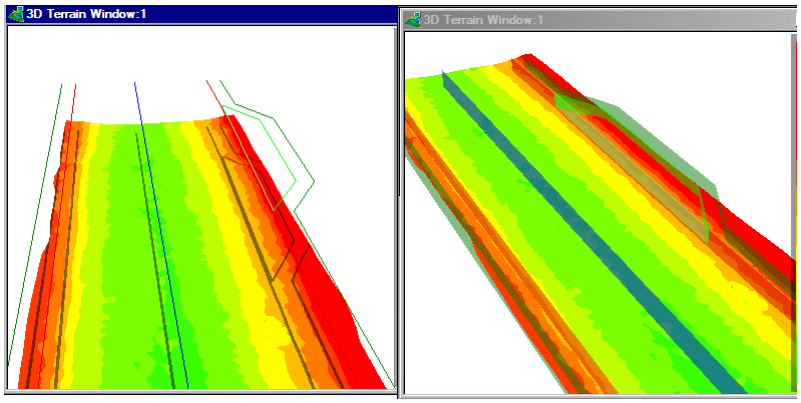


FIGURE 7-38. *2D Planned Lines (left), 3D Planned Lines (right)*

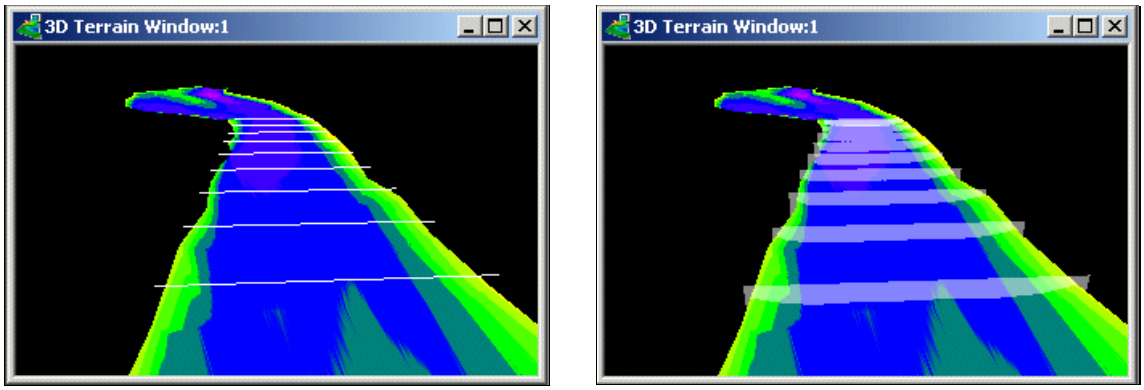
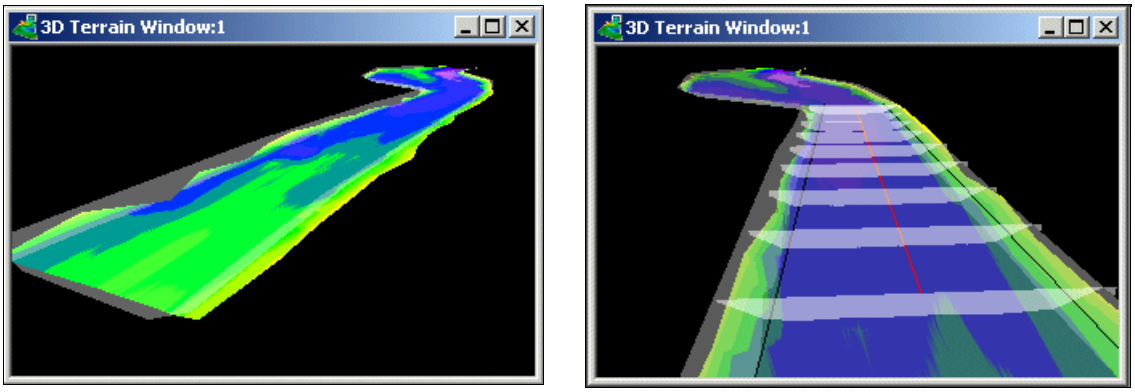


FIGURE 7-39. *Channel Display (left), All Feature Types: 2D Channel Lines, 3D Planned Lines and Channel (right)*



Clip against Terrain Extents: The ends of planned and channel lines will follow the boundaries of the ensonified area.

NOTE: The accuracy of the clipping is, affected by the Grid Cell Size set in your terrain settings. A smaller Grid Cell Size will clip the lines more closely to the edges of the ensonified area.

[Default] resets all settings to their defaults as shown in the sample dialog. All transparency settings are set to 50%, Channel Lines and Planned Lines are set to draw in 2 dimensions and each feature has a separate and distinct color.

The Camera and Lighting Position window displays are controlled through their respective settings dialogs. Once any of these objects that are displayed in the Terrain window, you may also display them in the Camera or Light Position window by checking the corresponding option in their settings dialog.

FIGURE 7-40. *Camera Position Window and Settings Dialog*

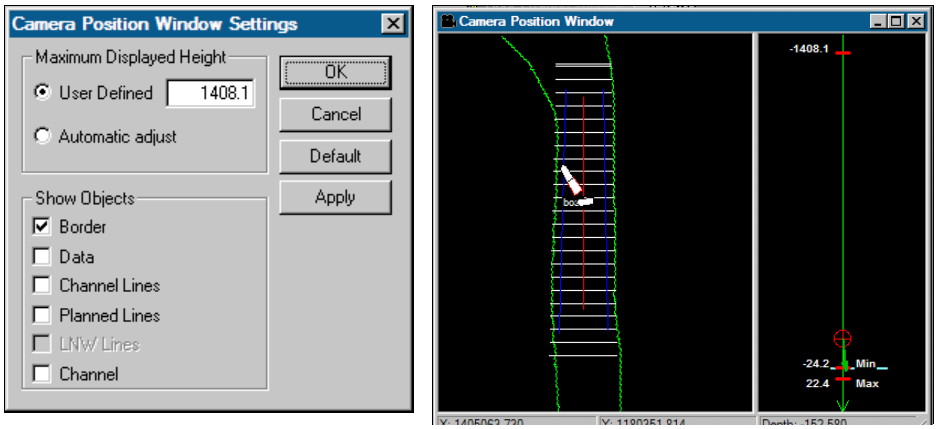
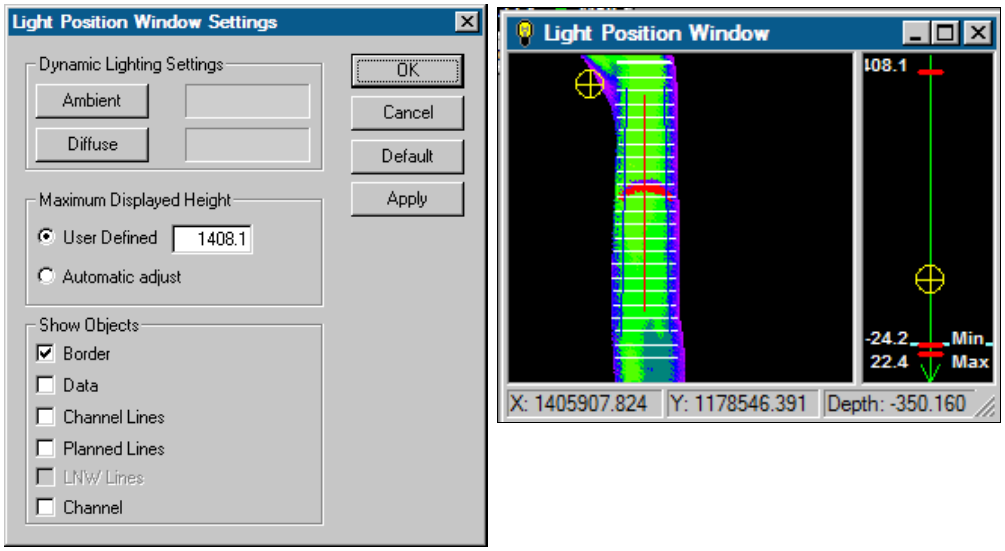


FIGURE 7-41. *Lighting Position Window and Settings Dialog*



NOTE: During data collection, when survey depths are continuously being updated, displaying the data in the Camera and Lighting Position Windows can slow the frame rate.

VIEWING TARGETS IN 3DTV

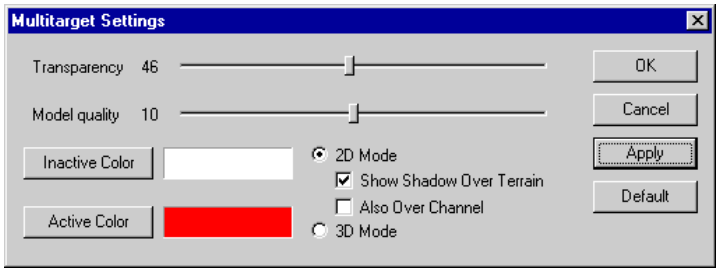
When a Target file is loaded in SURVEY or DREDGEPACK®, the targets can be displayed on the water surface in the 3D Terrain Viewer. They resemble the targets displayed in SURVEY or DREDGEPACK® in the number of circles surrounding the target point and the distance between them. The target name is displayed above the target.

To control which targets are displayed, select OBJECTS-TARGETS-SHOW and choose your option.

- **None** omits the targets from the display.
- **Selected** displays only the currently selected target.
- **All** displays all targets.

You can further customize the target display in 3DTV through the Multi-target Settings dialog which is accessed by selecting OBJECTS-TARGET-SETTINGS.

FIGURE 7-42. *Target Settings Dialog*



The **Transparency** is defined as a percentage where 100 makes them completely invisible and 0 makes them opaque. This is particularly important if you choose to display 3D targets. The labels are constantly visible.

Model Quality, based on a scale of 20, effects smoothness of the curved lines or surfaces that draw the target.

[Inactive Color] and **[Active Color]** enable you to choose the colors of the target display. The Active Color is for the currently selected target. Any other targets will be displayed in the Inactive Color.

2D Mode draws the targets on the water surface level. This is valid even if water surface itself is not shown. In this mode, you can also choose to project a shadow directly below the target.

- **Show Shadow Over Terrain** shows the shadow against the terrain. If a channel (CHN) is being displayed and is above terrain level, the shadow will not show.

- **Also Over Channel** always displays the shadow over the project area.

3D Mode vertically expands the target and any circles that surround it. The resulting appearance is a rod passing through the target center. Any surrounding circles appear as cylinders.

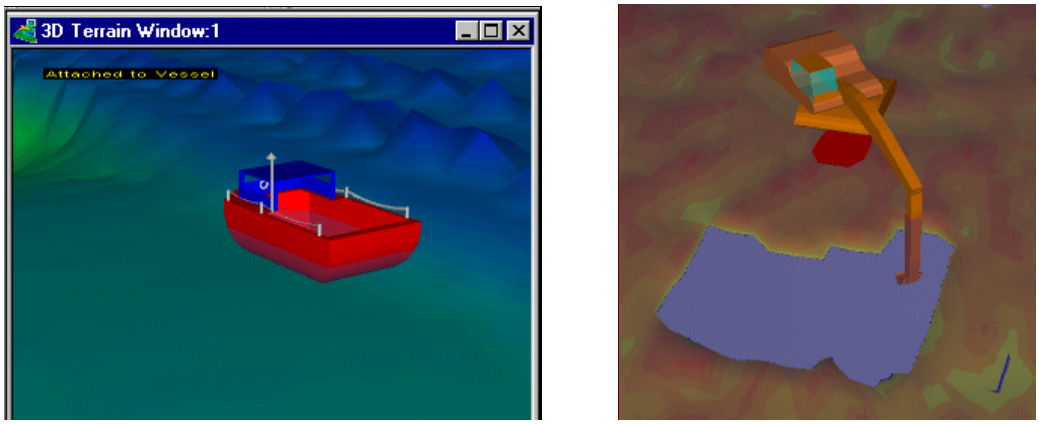
VIEWING BOAT SHAPES IN 3D TERRAIN VIEWER

You can load a vessel shape that will be positioned in 3DTV according to the information received through shared memory. Its origin (determined when the boat shape is created) is located at the current X,Y position. The vertical position of the vessel is adjusted according to the current chart datum level (CDL), and the tide and draft correction values. The vessel heading will coincide with heading data in shared memory.

If the selected boat is not shown, the camera is positioned at the boat position according to the information from shared memory.

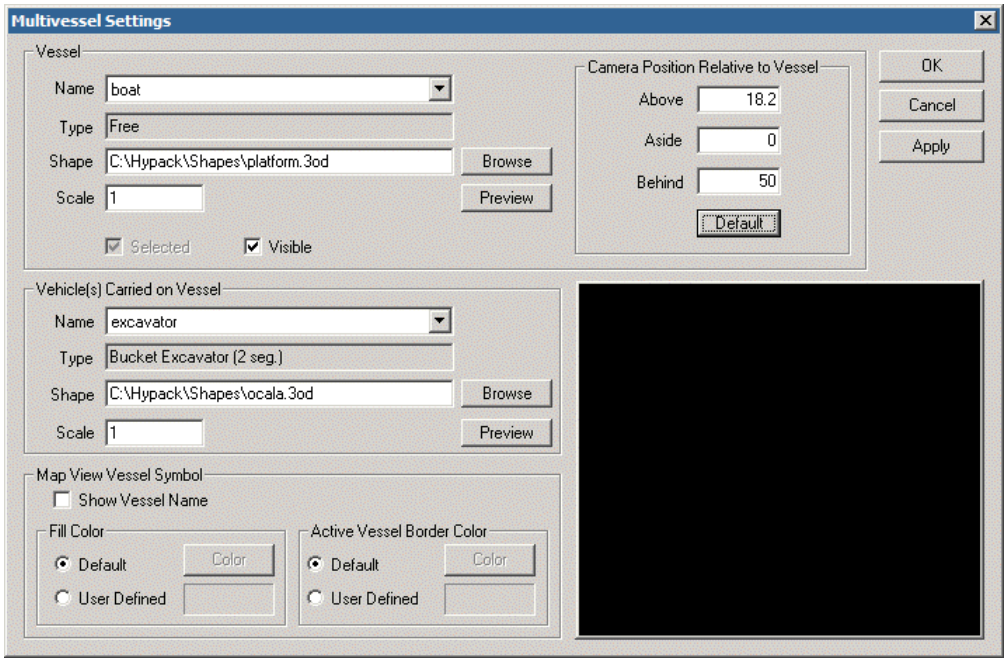
If the selected boat is shown, the camera in 3DTV will be positioned relative to the selected vessel according to the settings in the Multi-vessel Settings dialog. Once the boat is loaded and showing, you can view your data and your vessel as the survey progresses. This requires a 3D boat shape for each of your vessels that can then be imported into 3DTV. You can build custom shapes to match your actual vessel in the 3D SHAPE EDITOR or choose from those that are provided with the HYPACK® installation in the \Hypack\Shapes folder.

FIGURE 7-43. *Importing Custom Boat Shapes to Matrix 3DTV*



The Multivessel Settings dialog provides display options that affect your view of the boats. When you open a project in 3DTV or Matrix 3DTV for the first time, the Multivessel Settings dialog will appear. You can access the same dialog from Matrix 3DTV at any time by selecting VESSELS-SETTINGS.

FIGURE 7-44. *Multiple Vessel Settings Dialog—Defaults are shown*



The **Vessel Name** drop-down box is automatically populated with the vessel(s) in your hardware configuration. Select the vessel which the dialog settings should affect.

Type displays the custom shape type.

Shape enables you to assign a custom 3D Shape file (*.3OD) of your vessel. You can build custom shapes to match your actual vessel in the 3D SHAPE EDITOR.

- **To see a rotating display of your shape** in the bottom right of the dialog, click **[Preview]**
- **To modify the selected shape file**, click **[Edit]**. The 3D SHAPE EDITOR will be launched with the shape file loaded and ready for your changes.

Scale sets the scale of the shape in your display. If the scale of your vessel is unrealistic, you can use the scale factor to adjust it to something more accurate.

Selected makes all camera motion relative to that vessel. It is also the vessel on which the camera focuses when you click the 'Focus on Vessel' option. When the flight mode is 'Attached To Vessel', this vessel would be the 'active' vessel. In a multivessel project, checking this option for one boat will clear it for all other project vessels.

Visible controls the display of each vessel on an individual basis. You can remove all vessels from your display in 3DTV by selecting VESSELS-HIDE ALL VESSELS.

Camera Position Relative to Vessel: When a vessel is showing, the camera is positioned relative to the boat rather than at the boat position.

The Camera Position settings enable you to set the angle and distance from the boat where the camera should be located. As the vessel moves, the camera position will update to maintain these distances.

- **Above** (default=18.2) places the camera above the vessel reference point by the specified distance. You can use a negative value to view the vessel from beneath the waterline, but you can not position the camera below the survey bottom.
- **Behind** (default=50) positions the camera to follow the vessel by the defined distance. A negative value positions the camera in front of the vessel. (In this case, you probably want to check the Focus the Vessel option so the camera will face the vessel and move backward.)
- **Aside** (default=0) offsets the camera port or starboard of the vessel midline. A positive distance value positions the camera to the port side, while a negative value moves the camera starboard.

[Default] sets all of these camera position settings to their default value. These values are shown in the previous figure.

A 2-dimensional boat shape is also displayed in the Map View of the Camera and Light Position Windows. The settings under "Map View Vessel Symbol provide display options for this symbol.

- **Show Vessel Name** displays the name associated with each vessel beside each shape.
- **Fill Color** displays a color dialog from which you can choose a color for the vessel. This enables you to easily differentiate between multiple vessels in the map view.
- **Active Vessel Border Color** sets the color of the perimeter of the shape when it is the selected vessel.
- The **Default** colors will automatically choose a color that will appear clearly against the current background color. If you choose one of the User-Defined options, its **Color** button will be enabled for you to access a color dialog and choose a new color.

Vehicle(s) Carried on Vessel is under development. These options are only enabled by certain drivers. (At this point, only the excavator4 driver is the only one.) The excavator4.dll manages all of the data regarding the motion of the excavator-type dredge. If this driver is included in the hardware configuration, 3DTV enables these options to define 3D shape information for the excavator which is carried on the platform.

[Apply] updates the vessel settings allowing you to preview your display in the Terrain window without leaving the settings dialog.

In addition to the options in the Vessel Settings dialog, the Vessels menu includes a number of features that can be toggled on and off.

Show Shadow: If a boat shape is showing, you can also display the shadow of the shape on the survey bottom, positioned directly below the boat (regardless of the light source position). It may be very useful to know exactly where you are above the terrain. You can control the

shadow display by selecting VESSELS-SHADOW and one of the options.

- **OFF** turns the shadow display off.
- **Over Terrain** shows the shadow against the terrain. If a channel (CHN) is being displayed and is above terrain level, the shadow will not show.
- **Over Terrain and Channel** always displays the shadow over the project area.

More Information

- "3D Shape Editor" on page 8-33

VIEWING DREDGING EQUIPMENT

In a dredging project, if you display your vessel, Matrix 3DTV can also display your digging tool, the arm on which it is mounted. The Vessel menu provides options which toggle the display of each of these items on and off. Settings dialogs are provided for you to customize the display of each item.

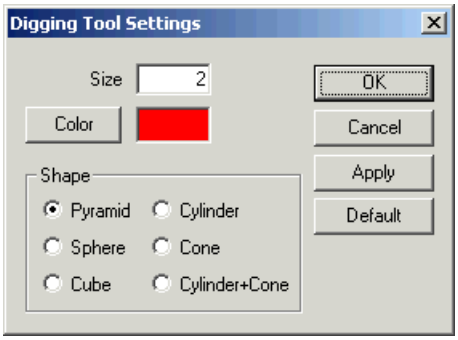
DIGGING TOOL OPTIONS

If the vessel is showing, you can also display a representation of the digging tool by selecting VESSEL-SHOW DIGGING TOOL. The digging tool will be shown with its lower point at the X, Y, Z position read from HYPACK's Shared Memory area.

FIGURE 7-45. *Digging Tool displayed as a red pyramid.*

You can customize the size (height and width are the same), color and shape of the tool through the Digging Tool Settings dialog. Select VESSEL-DIGGING TOOL SETTINGS to access the dialog. The following figure shows the default settings:

FIGURE 7-46. *Digging Tool Settings*



The **Size** of the digging tool is expressed in survey units.

[Color] accesses a color selection dialog. Choose the color you like and click [OK].

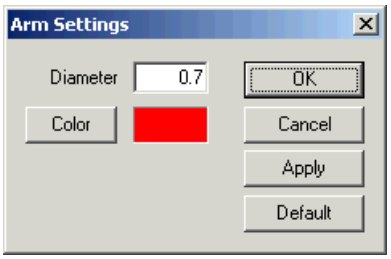
Shape provides a selection of shapes that you may use to represent the digging tool.

DREDGE ARM OPTIONS

Elect to display the arm connecting the digging tool to the vessel by selecting VESSEL-SHOW ARMS.

You can customize the arm display through the Arm Settings dialog. Select VESSEL-ARM SETTINGS to access the dialog. The following figure shows the default settings.

FIGURE 7-47. *Arm Settings*



Diameter controls the thickness of the arm in survey units.

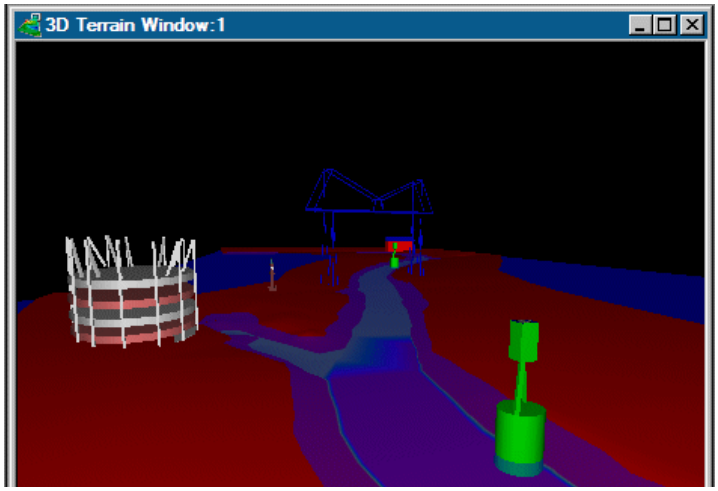
[Color] access a color selection dialog. Choose the color you like and click [OK].

VIEWING CUSTOM SHAPES (*.3OD) IN 3D TERRAIN VIEWER

In addition to vessel shapes, other custom shapes created in the 3D SHAPE EDITOR can be imported for display in 3DTV to enhance your presentation. Enter shape, positioning and scale information in the Object Deployment dialog and your display can include models of such things as buildings, bridges, piers, buoys, power lines, and pipe lines. The possibilities are endless.

In the following figure, you can see both floating and static shapes.

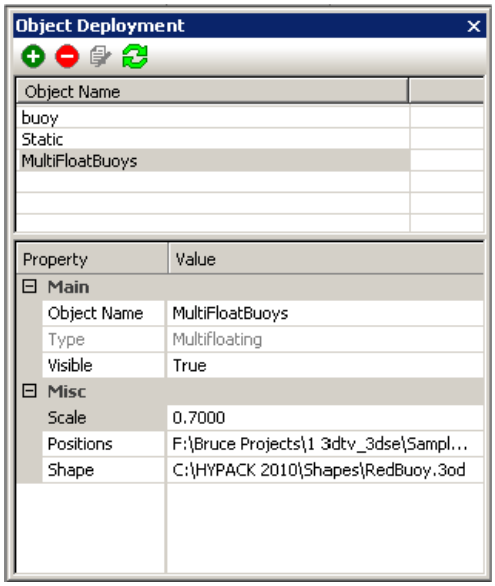
FIGURE 7-48. *Displaying Custom Shapes in the Terrain Window*



The process is as follows:

1. **Make your custom shapes** (*.3OD) in the 3D SHAPE EDITOR. If your display has multiple instances of the same shape, only one custom shape file is required.
2. **Prepare a positioning file (*.3OP) for any single object that has constant XY position (static or float type)**. Use any text editor for this.
3. **Launch 3DTV or MATRIX 3DTV**.
4. **Open the Object Deployment dialog** by selecting VIEW-TOOLBARS-OBJECT DEPLOYMENT.

FIGURE 7-49. *Custom Shapes in 3DTV*



5. **Load and position your custom shapes** in your display**.** Once you have applied the object type, shape file and positioning information, you should see your shapes appear in your 3DTV landscape at the defined positions to match the scale of the custom shape with the scale of your 3DTV presentation.

TIP: The display in the Object Deployment dialog is synchronized with the map display. When you have loaded multiple shapes, you can select a shape in either the dialog or the map and see it highlighted in the other location. All of the shapes in a multistatic or multifloat entry will be highlighted together.

TIP: If at this point you realize you need to modify or create a new shape (*.3OD) or positioning (*.3OP) file the Edit button is an easy solution.

- **To modify an existing file**, place the cursor in the Shape field of the Object Deployment dialog and click the Edit File icon. 3DTV automatically launches the 3D SHAPE EDITOR.

  - If the Shape field was filled, that shape will be loaded in the editor, ready for your changes.
  - If the Shape field was blank, the New dialog will appear for you to select the 3OD file to be changed, then listed in the Shape field.
- **To generate a new file,** place the cursor in the empty field and click [Edit]. When the New dialog appears, name your new 3OD file and click [Save].

6. **Set the Visible option,** typically to 'True'. This option works together with OBJECTS-3D OBJECTS-SHOW option as follows:

TABLE 7-5. *Object Deployment 'Visible' option affected by Objects Menu '3D Objects-Show' Option.*

To show		Obj. Deployment Show Setting	Menu 3D Objects Setting
To always show all objects		Set all objects to 'Yes'	Selected
	OR	N/A	All
To show only selected objects		Set those you want to see to 'Yes'	Selected
To show no objects		Set all objects to 'No'	N/A
	OR	Set some or all to 'Yes'	None

7. **Apply a scale factor** (optional). If the scale of your custom shape is not accurate, this modifies its size in your 3DTV display. A factor

less than one decreases the size while factors greater than one increase the size. (Negative factors should not be used. They invert your shape.)

8. **When you are satisfied with your display, click [OK]** to return to save your settings and return to 3DTV.

3OD Object Types in the 3D Terrain Viewer

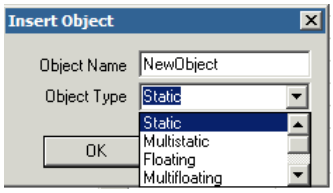
Object Types tell 3DTV how 3OD shapes are positioned and whether their vertical position is affected by changing tides.

- **Static** objects have constant XYZ positions. These might include such objects as bridges and buildings. The Static object option displays only one custom shape.
- **Multistatic objects** display multiple instances of static objects using the same custom shape. Notice there is a separate setting for objects derived from the Pole templates in 3D SHAPE EDITOR.
- **Floating** objects have fixed XY positions, but their vertical position (Z) changes with the tide. Buoys are a common example of floating objects.
- **Multifloating** objects display multiple instances of floating objects using the same custom shape (*.3OD).
- **Poles** are created from the Pole template in the 3D SHAPE EDITOR. They resemble a basic power or telephone pole with a user-defined number of wires connecting their crosspieces. When multiple poles are displayed in 3DTV, wires automatically connect the like-numbered wire attachment points defined in the shape file. The order in which they are connected is determined by the positioning file.
- **Pipes** are horizontal, possibly multi-segmented cylinders. *They are not 3OD files*. Instead, their properties are described in the Object Deployment dialog.

Loading Custom Shapes in the 3D Terrain Viewer

1. **Select VIEW-TOOLBARS-OBJECT DEPLOYMENT** and the Object Deployment dialog will appear.
2. **Add a Custom Shape**:
   a. **Click the Insert Object icon.** An additional dialog will appear.

FIGURE 7-50. *Insert Object Dialog*



b. **Enter the object name and type, and click [OK].** The right-hand side of the Object Deployment dialog automatically fills with the required display parameters for the chosen object type.

c. **Select the custom shape.** Place your cursor in the Position Value field click its […]. A File Select dialog will open for you to indicate your shape file.

NOTE: If you have not yet created the custom shape you need, you may access the 3D SHAPE EDITOR by placing your cursor in the Shape Value field and clicking [Edit].

3. **Position your Custom shape.** Positioning is defined through X, Y, Z, and heading information.
   - For **Static** and **Floating** objects, this data is entered directly into the Object Deployment dialog.
   - **Multistatic**, **Multifloating** objects, as well as **Poles** and **Pipes**, require a positioning file (*3OP).

     A positioning file is a simple space-delimited ASCII text file (created in your favorite text editor) listing a set of X, Y, Z, heading settings for each incident of this custom shape in the display. For Pipes the positions define each end and each vertex and the headings are ignored. Even though the height of Multifloat objects is determined by the water height, a Z value of 0.00 must be included in the positioning file.

FIGURE 7-51. *Sample Positioning File (*.3OP)*

```
449423.16 521620.59 0.00 0.0
451309.75 520989.12 0.00 0.0
451677.67 521088.28 0.00 0.0
451925.57 521297.03 0.00 0.0
452990.20 522408.63 0.00 0.0
453003.25 522494.74 0.00 0.0
453924.36 523551.54 0.00 0.0
454075.71 523734.20 0.00 0.0
454540.18 524624.00 0.00 0.0
454172.25 526367.08 0.00 0.0
454109.63 526518.42 0.00 0.0
454404.49 526792.41 0.00 0.0
454639.33 527241.22 0.00 0.0
455022.91 527922.27 0.00 0.0
455390.84 528577.23 0.00 0.0
```

NOTE: If you have not yet created the positioning file you need, you may access NotePad (or other text editor assigned to 3OP files in your Windows settings) by placing your cursor in the Positions field and clicking the Edit icon.

To adjust the positioning:

Select the loaded 3OP file and click [Edit]. The 3OP will open in the application defined for them in the Windows settings or, by default, in NotePad. If you save the modified file to a new name, you update the file selection in the Object Deployment dialog.

To Delete a Custom Shape: Select the custom shape and click [Delete Object].

POSITIONING YOUR CAMERA IN THE 3D TERRAIN VIEWER

The key to 3DTV is manipulating the imaginary camera to view your data set, and any objects you may have loaded to your display, in a way that is most useful for your purposes.

In Free Flight mode, you are in full control of the camera. You can define the:

- Horizontal Position
- Heading
- Tilt
- Zoom
- Vertical Position
- Yaw
- Speed

In other flight modes, some of these attributes are determined by nature of the mode. For example, in Attached to Vessel Mode, the camera speed and heading matches that of the Survey Vessel. The controls are disabled and 3DTV reads the information from shared memory.

CAMERA POSITIONING TOOLS IN THE 3D TERRAIN VIEWER

All of the camera position, direction and orientation settings can be controlled in multiple places in the 3DTV interface. (Speed and Zoom can only be set using the corresponding controls on the Camera Control Toolbar.) The following sections provide a brief description of each tool.

CURSOR INTERACTION IN THE TERRAIN WINDOW

A few simple operations with your cursor in the Terrain window quickly and intuitively adjust the camera position, heading, height and tilt.

Each operation begins with a click on the terrain model which places a cone-shaped marker at that location. The mouse operation centers around that point.

NOTE: The distance between the marker and camera is limited to 5 times the terrain size.

TABLE 7-6. *Controlling the Camera with your Mouse in Anchor Mode*

Mouse Action	Result
Click + drag	Shifts the camera position horizontally in a manner such that it appears the terrain model moves in the direction of the cursor motion.
Ctrl + Click and drag	• Drag mouse forward and back shifts the camera position horizontally and vertically, and adjusts its height and tilt in a manner such that it appears the terrain model rotates around the Y-axis of the display at the cursor position. (This is only the same as the Y-axis of the projection if the camera heading is zero.). • Drag mouse left and right shifts the camera position horizontally, and adjusts its tilt and heading such that it appears the terrain is rotating around the cursor position.
Click + scroll (with the mouse wheel)	Changes camera distance from the selected point on the terrain. This operation shifts both the horizontal and vertical positions in a manner that maintains the current camera tilt. **NOTE:** This control is limited to Free Flight mode when at least a portion of the terrain is visible.

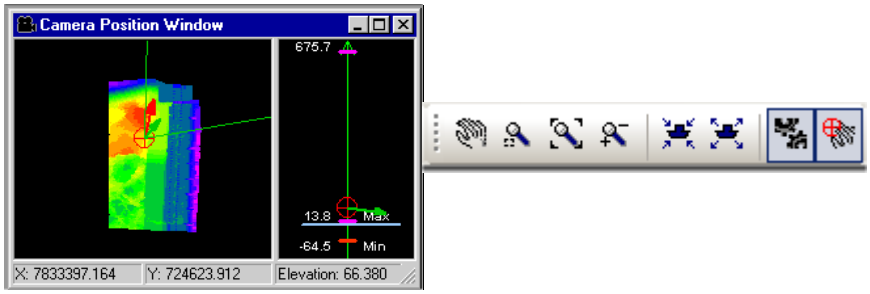
THE CAMERA POSITION WINDOW

The **Camera Position Window** can be displayed (if it isn't already) by selecting CAMERA-POSITION WINDOW. It displays:

- The horizontal position relative to your survey area (left pane).
- The camera's vertical position relative to the minimum and maximum depth found in your file (right pane).
- The direction the camera is pointing—both yaw and tilt (green arrow).
- The direction the camera is traveling (red arrow).
- The view range (the area between the green lines).
- The water level (if it is displayed).
- The maximum graph depth/elevation, which determines the scale of the graphic.
- The current level of the camera or, if the cursor is over the vertical scale, of the cursor.
- The vertical direction in which the Z-value is positive (arrow on Z-axis).

The displays in each side of the window update to give you visual feedback as you move the camera.

FIGURE 7-52. Camera Position Window (left), Map View Toolbar (right)



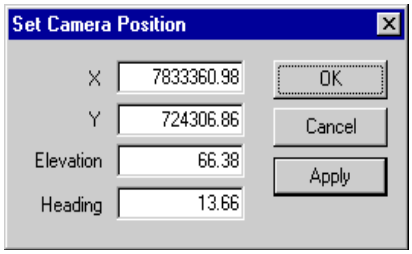
To adjust the display in the map view, place the focus on the Camera Position Window and use the tools in the map view tool bar. The unusual functions work as follows:

- **Zoom in Vessel** and **Zoom out Vessel** position the vessel in the center, then zoom in or out. The effect is as the map view is translated to position the vessel in the center, and then is left/right mouse clicked on the vessel origin, when Zoom In/Out is switched on. Zoom in Vessel and Zoom out Vessel are disabled when the vessel is not available.
- **Synchronized Zoom** keeps synchronization between zoom in Camera Position Window and Light Position Window, applying and forwarding zoom commands from the active window to the other one.

CAMERA SET POSITION DIALOG

The **Camera Set Position Dialog** is accessed by selecting CAMERA-SET POSITION. It enables you to set the horizontal and vertical positioning, as well as the heading of the camera.

FIGURE 7-53. Camera Position Dialog-- Z-value will be labeled with "Depth" or "Elevation" according to your project mode.



1. **Enter the settings** for each attribute.
2. **Use [Apply] to preview** your settings in the 3DTV windows.
3. **When you are satisfied, click [OK]** to return to the program.

If the camera is moving, when a new position is applied, it immediately changes position and heading according to the new settings, but continues moving at the same speed. Camera Yaw and Tilt are unchanged.

MULTIVESSEL SETTINGS DIALOG

When a vessel is being displayed, the camera is positioned relative to the boat according to the settings in the Vessel Settings dialog.

More Information

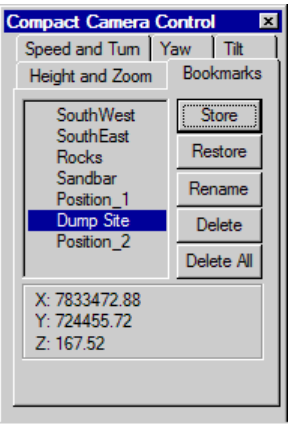
- "Viewing Boat Shapes in 3D Terrain Viewer" on page 7-318

BOOKMARKS

At any time, you can save a composite of all current camera position, direction, and orientation settings. (Zoom and Speed are not included.) These positions are handy if you see something particularly interesting, or you find that you have an especially good viewing angle, and you want to be able to easily return to that viewing position later.

Bookmarks enable you to save and name multiple camera positions. They are controlled in the Bookmarks area of the Camera Controls toolbars.

FIGURE 7-54. *Bookmarks Tab in the Compact Camera Controls*



Bookmark availability depends on the current flight mode and the mode in which you created your bookmarks.

Mode	Bookmarks Visible
Free Flight	ALL
Follow Path	Bookmarks generated on the current line of the current line file. **NOTE:** Bookmarks will become unavailable, except in Free Flight mode, if there is any change in the line file name, the line name or line position
Circle	Bookmarks generated while on the same circle (same center and radius).

NOTE: While bookmarks may be generated and manipulated in Circle mode, it is nearly impossible to display them in Circle mode again, as there is no easy way to re-establish the exact same circle size and position. They are, however, always available in Free Flight mode.

To bookmark a position: Click **[Store Position]**. Each stored position is saved with a default "Position_*Number*" label and its XYZ coordinates are displayed in the Bookmarks area.

To modify the bookmark name:

1. **Select the bookmark** by clicking on it. (It will be highlighted.)
2. **Click [Rename], enter the new position name and press the enter key**.

To restore the camera to bookmarked positions: Select the correct bookmark and click **[Restore Position]** (or double click on the bookmark)**.** When the camera is at a restored position, the corresponding bookmark is indicated with an arrow symbol (>). If the camera was in motion, the motion will be paused at the restored position.

NOTE You cannot restore positions when you are in Attached to Vessel flight mode.

To remove a bookmark: Select it and click [Delete].

To remove all bookmarks: Click [Delete All].

CAMERA CONTROLS

Camera Controls are contained in the Camera Control tool bars. Each attribute has a labeled control with which you can manipulate the camera. The diagrams and text information provided with each set of controls, gives you detailed information about the status of each setting in the camera controls. Modes other than Free Flight Mode predefine some of these attributes and will disable the corresponding controls as noted.

NOTE The Compact Camera Control has the same functions as the Camera Control except the Map and Side View diagrams It simply frees screen space for other displays.

FOCUS ON VESSEL

In 'Attached to Vessel' mode, the camera is always positioned relative to the vessel position. The 'Focus on Vessel' feature adjusts the tilt and yaw of the camera to face it toward the vessel of your choice. The icons on the

TABLE 7-7. *Focus on Vessel Tool Bar*

Icon	Runction
	Focuses the camera on the vessel selected in the Mulivessel Setup dialog.

Icon	Runction
	Locks the camera focus on the current vessel.
	Changes focus to the next or previous vessel in your configuration. These are enabled only when the lock is off.

More Information

- “Attached to Vessel Mode” on page 7-290
- “Multivessel Settings Dialog” on page 7-329

KEYBOARD SHORTCUT COMMANDS

A set of keyboard shortcuts have been created to replicate all of the camera control functions (except the default positioning feature). Once you are familiar with them, your viewing area can be increased by hiding the Camera Control tool bar. To help you along, a list of the keyboard commands can be accessed by selecting HELP-KEYBOARD SHORTCUT.

A few of these shortcuts affect camera motion regardless of the type of motion.

- **[Pause] or Spacebar** temporarily stops the camera motion. When the motion is paused, the text on the button changes to "Resume".
- **[Resume] or Spacebar** restarts the camera motion at the same speed and rate of turn values as before the pause.
- **[Stop]** or **Ctrl + NumPad 0** permanently stops the camera motion, setting its speed, and turn and elevation rates of change to zero. Stop does not affect Yaw, Tilt, and Zoom controls.

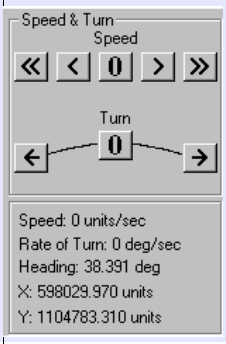
NOTE In some cases, to initiate the opposite action, it will be more efficient to click [0] to stop the camera motion, then use the opposite arrow to begin motion in the opposite direction.

More Information

- “3D Terrain Viewer Keyboard Commands” on page 10-53

MODIFYING THE CAMERA'S HORIZONTAL POSITION

The horizontal positioning is the XY position of the camera.

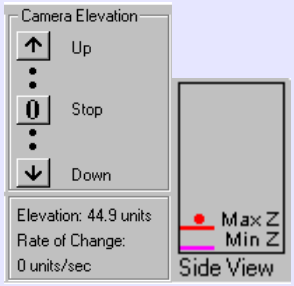
Tool	Procedure
Camera Positioning Window	Click in the map view at the position relative to your data where you want the camera. The red circle will move to that location and the effect will be seen in the 3D Terrain window and in the Side View. This method is quick and easy, is not accurate.
Camera Set Position Dialog	Enter the X and Y projection coordinates. Use this option for accurate positioning.
Camera Controls	Use the Speed and Turn controls together to navigate your camera in the display. (Turn controls alone will not change the camera position.) Use the **Turn buttons** to change the direction the camera moves. • **Left and Right Arrows (<- and ->):** Controls the speed of the camera's change in direction of travel Each click increases the turning speed by 1 degree/second. • **Zero ([0]):** Stops the turn. Use the **Speed buttons** to control how fast (or slowly) it moves. • **Arrow ([<] and [>]):** Increment and decrement speed by 1 unit/sec. • **Double Arrow ([<<] and [>>]):** Increment and decrement speed by 10 units/sec. • **Zero ([0]):** Stops the camera's travel.
Camera Speed and Turn Controls	***FIGURE 7-55.*** 
Keyboard Shortcuts	• **Right Arrow:** Turns +1 degree/second • **Ctrl + Right Arrow:** Turns +10 degrees/second • **Left Arrow:** Turns -1 degree/second • **Ctrl + Left Arrow:** Turns -10 degrees/second • **R:** Set turn change to 0.
Cursor in the Terrain Window	Each of the cursor actions in the Terrain window cause the terrain to shift horizontally.

More Information

- "Cursor Interaction In The Terrain Window" on page 7-327

MODIFYING THE CAMERA'S VERTICAL POSITION

The vertical positioning is the Z coordinate of the camera.

Tool	Procedure
Camera Positioning Window	Click in the side view of the window at the height, relative to your data, where you want the camera. The red circle will move to that location and the effect will be seen in the 3D Terrain Window and in the Side View. This method is quick and easy, but is not accurate
Camera Set Position Dialog	Enter the Z coordinate. Use this option for fast and accurate positioning.
Camera Controls	The Elevation controls adjust the height above the survey area by changing the vertical speed of the camera. • **Up and Down Arrows:** Increases/decreases the elevation by 1 unit/second for each click. • **Zero ([0]):** Stops the camera at the current height.
Camera Elevation Controls	
Keyboard Shortcuts	**Up Arrow:** +1 unit/second **Ctrl + Up Arrow:** +10 units/second **Down Arrow:** -1 unit/second **Ctrl + Down Arrow:** -10 units/second **Z**: Stop elevation change
Cursor in the Terrain Window	Some of the cursor actions in the Terrain window cause the terrain to shift vertically..

The camera position relative to the depth/elevation range found in your data set is displayed in the Side View graphic. If the camera is outside of the window's range, an arrow will point to the top of the window. The program does not allow you to position the camera lower than the maximum depth found in the current grid cell. (You determined the grid cell size in the Terrain Settings when you began this 3DTV project. They

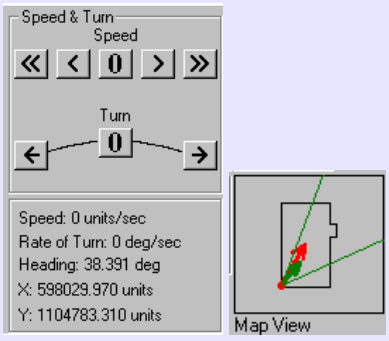
can be edited by selecting TERRAIN- SETTINGS.) If some grid cells are "empty" (there is no data sounding in them), the camera may drop through the terrain.

More Information

- "Cursor Interaction In The Terrain Window" on page 7-327

MODIFYING THE CAMERA HEADING

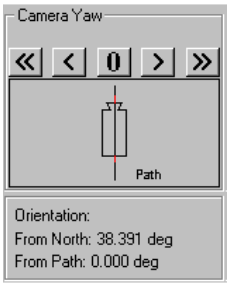
As with vessel heading, camera heading is its direction of travel.

Tool	Procedure
Camera Positioning Window	• **CTRL + Right-click** in the map view on the point toward which you want the camera to travel. • **Click and drag the mouse** to determine direction of the camera (blue arrow will appear). The red camera indicator will be positioned at the point of the click and move in the direction of the drag. The effect will be seen in the 3D Terrain Window, in the Heading under the Speed and Turn control, and in the Map View.
Camera Set Position Dialog	Enter Heading. A value of 0 is straight up. Use this option for fast and accurate positioning.
Camera Controls	The Turn controls determine the direction in which the camera moves. Turn buttons are only enabled in Free Flight mode. • **Left and Right Arrows (<- and ->):** Controls the speed of the camera's change in direction of travel Each click increases the turning speed by 1 degree/second. • **Zero ([0]):** Stops the turn. The data below the Speed and Turn buttons displays your current settings. The Map View and Camera Position Window also provide a pictorial representation. If the camera position is outside of the Map View, an arrow will point to the window edge to indicate where it is positioned.
Camera Speed and Turn Controls	

Tool	Procedure
Keyboard Shortcuts	• **Right Arrow:** Turns +1 degree/second. • **Ctrl + Right Arrow:** Turns +10 degrees/second • **Left Arrow:** Turns -1 degree/second • **Ctrl + Left Arrow:** Turns -10 degrees/second • **R**: Set turn change to 0.
Cursor in Terrain Window	• **Ctrl + Click and drag mouse left/right** shifts the camera position horizontally, and adjusts its tilt and heading such that it appears the terrain is rotating around the cursor position.

MODIFYING THE CAMERA YAW

Yaw is the angle at which the camera is pointing relative to the direction of travel.

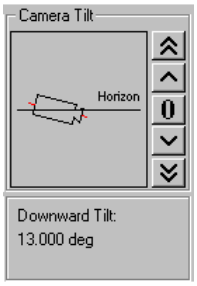
Tool	Procedure
Camera Positioning Window	Right click in map view on the point at which you want the camera to face. The green camera indicator arrow will update here and in the Map View on the Camera Control tool bar. The 3D Terrain Window and the Camera Yaw control will also update. This is a quick way to modify the camera yaw, however it is difficult to adjust to an exact yaw angle if it is required.
Camera Controls	The Camera Yaw Controls enable you to turn the camera left and right of the direction of travel. • **Arrow ([<] and [>]):** Turns the camera left and right by 1 degree. • **Double Arrow ([<<] and [>>]):** Turns the camera left and right by 10 degrees. • **Zero ([0]):** Camera looks in the direction of travel. The orientation relative to North and relative to the direction of travel are displayed below the control buttons.
Camera Yaw Controls	

Tool	Procedure
Radar Mode	Radar mode allows the camera to sweep back and forth, constantly changing yaw at a user-defined speed and within a user-defined range. The map in the Camera Position window shows the angle with two dotted lines. 1. **Put the program in Free Flight** Mode. 2. **Activate Radar Mode** by depressing the Camera Radar Mode icon. 3. **Click the Radar Angle Icon.** 4. **Set the sweep angle** by clicking at the enter point of the viewing angle and drag to define the distance port or starboard you to which you want to scan. The radar angle will automatically expand the same distance in the other direction. (The final radar angle will be twice what you define with your cursor.) 5. **Control the speed of the sweeps** using the Camera Yaw controls.
Keyboard Shortcut	• **NumLock + NumPad 6:** Yaw +1 degree • **NumLock + Ctrl + NumPad 6:** Yaw + 10 degrees • **NumLock + NumPad 4:**Yaw – 1 degree • **NumLock + Ctrl + NumPad 4:** Yaw - 10 degrees • **NumLock + NumPad 5:** Yaw and Tilt set to 0

MODIFYING THE CAMERA TILT

The Camera Tilt adjusts the angle of view relative to the horizon. The tilt angle may range from -180 degrees to 180 degrees.

Tool	Procedure
Camera Positioning Window	Right click in the side view at the spot to which you want the camera to point. The green arrow will adjust accordingly. Updates will also occur in the 3D Terrain Window and in the Camera Tilt control. This method is good to establish the general "pitch" of the camera.
Camera Controls	The Camera Tilt controls adjust the tilt. The current setting is displayed below the graphic. • **Arrow**: Tilts camera up and down by 1 degree/click • **Double Arrow:** Tilts camera up and down by 10 degrees/click • **Zero ([0]):** Tilts camera to 0 degrees. This method is more accurate and is useful for fine tuning your view.

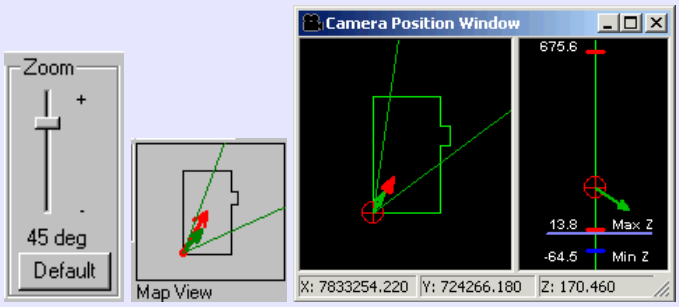
Tool	Procedure
Camera Tilt Controls	
Keyboard Shortcuts	• **NumLock + NumPad 8:** Tilt + 1 degree • **NumLock + Ctrl + NumPad 8:** Tilt + 10 degrees • **NumLock + NumPad 2:** Tilt - 1 degree • **NumLock + Ctrl + NumPad 2:** Tilt - 10 degrees • **NumLock + NumPad 5:** Yaw and Tilt set to 0.
Cursor in Terrain Window	**Ctrl + Click and drag** mouse left/right shifts the camera position horizontally, and adjusts its tilt and heading such that it appears the terrain is rotating around the cursor position.

MODIFYING THE CAMERA SPEED

The Speed controls determine the camera's travel speed. Speed buttons are enabled in Free Flight, Follow Path, and Circle Flight modes.

Tool	Procedure
Camera Controls	• **Arrow ([<] and [>]):** Increment and decrement speed by 1 unit/sec. • **Double Arrow ([<<] and [>>]):** Increment and decrement speed by 10 units/sec. • **Zero ([0]):** Stops the camera's travel.
Keyboard Shortcuts	• **NumPad –:** Decrease Speed by 1 unit/second • **NumPad +:** Increase Speed by 1 unit/second • **S**: Sets Speed to 0

MODIFYING THE CAMERA ZOOM

Tool	Procedure
Camera Control	The Camera Zoom slide control adjusts the range of view. (This is similar to the standard snap shot versus wide angle and panoramic shots with a still life camera.) The current angle is printed below the slide control. **[Default]** snaps the angle to 45 degrees. The Map View and Camera Position Window show the view range (the area between the green lines) .
Camera Zoom Controls	
Keyboard Shortcuts	• **NumPad /:** Zoom In • **NumPad ***: Zoom Out

SAVING YOUR VIEWS IN THE 3D TERRAIN VIEWER

3DTV provides a selection of tools to store selected views in your Terrain window. You can save a simple screen capture or record either a 3DM or AVI file to store moving displays.

EXPORTING A SCREEN CAPTURE

You can quickly and easily take a screen capture of your 3D Terrain Window by selecting TOOLS-TAKE A SNAPSHOT or by clicking the corresponding icon in the Accessories Toolbar. The Windows® File Save dialog will appear for you to name the file. You can choose to save it as a JPG, BMP or TIF file.

RECORDING A 3D TERRAIN VIEWER MOVIE

The Movie Control Toolbar enables you to record and replay a specialized 3DTV movie of your display so you can later replay what it viewed. The resulting 3DM file is much smaller than an AVI file, but it can only be replayed in 3DTV.

FIGURE 7-56. Camera Movie Controls

Record a movie by clicking the record button (or TOOLS-RECORD MOVIE) then use the camera controls to scan the area.

NOTE: In Matrix 3DTV mode, when the vessel passes from one MTX file to another, the movie recording will be stopped automatically. You can save the recorded movie or to start recording again.

Pause the recording by clicking the pause button on the movie toolbar. This can be useful if you're viewing an area that's of no particular interest. The camera motion will continue while the movie is paused.

Resume recording by clicking the same button again.

Stop recording by clicking the stop button on the movie toolbar.

Save your movie, when you are satisfied with what you recorded, by clicking **[Save]**. 3DTV will display a File Save dialog for you to name your file. The information will be saved to a *.3DM file. The File Save dialog will first default to your project directory, but you may choose another location. Each save after that will default to the last save location chosen.

Replay your movie by clicking **[Load]** (or TOOLS-LOAD MOVIE) and selecting the 3DM file.

- **Play the movie in the same amount of time** by clicking the play button (or MOVIE-PLAYBACK).
- **Manually scan your movie** by dragging the slide button across the toolbar. This is helpful if you want to review certain portions of the movie without taking the time to see the whole recording. It also enables you to move back and forth through your data. After positioning to the desired frame of the movie, you can start replaying the movie from that point by clicking the Play button. Manual scanning is disabled while a movie is being replayed.
- **Pause the movie playback** by clicking the Pause button on the movie toolbar. **Resume playback** by pressing the Pause button again.

NOTE: Movie playback will work only for the same terrain data as were loaded when movie is recorded. You can not load movie recorded above other terrains.

RECORDING TO AN AVI FILE

You can also record the output of the most recently activated Terrain window into an AVI file. AVI files are much larger than a 3DM file, but they can be viewed using any media player software.

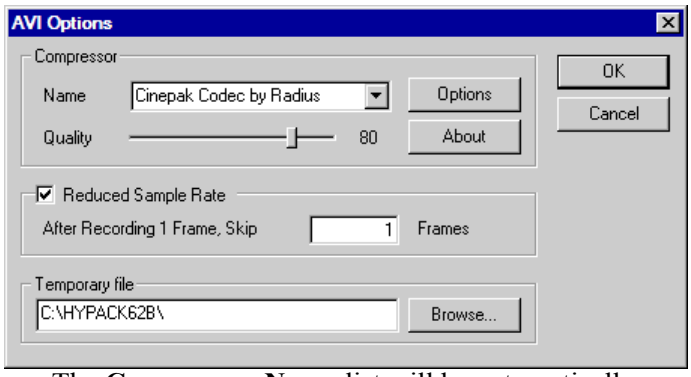
To begin recording select TOOLS-RECORD AVI, or click the AVI icon on the Accessories toolbar.

To stop recording select TOOLS-STOP AVI, or click the AVI icon on the Accessories toolbar. A File Save dialog will appear for you to name your file.

NOTE: While AVI file recording is in progress, the corresponding 3D Terrain Window will not be resizable (manually or through minimize/maximize buttons).

Before recording your file, set the compression options in the AVI Options dialog. Access the AVI Options dialog by selecting TOOLS-AVI OPTIONS.

FIGURE 7-57. *AVI Options*



- The **Compressor Name** list will be automatically populated with all video compressor programs on your computer. Select the compressor you wish to use.
- The **Compressor Quality** slide controls the resolution of the resulting AVI display. It is enabled only when supported by your selected compressor. A higher quality setting results in a larger file with improved resolution.
- If the compressor supports further settings, **[Options]** will be enabled for you to access a compressor-specific setup dialog. Please refer to the documentation from the compressor source for information about these options.
- **Reduced Sample Rate** further reduces the size of your AVI file by omitting a user-defined number of frames after each recorded one.
- The **Temporary File Path** determines where your AVI file is stored while you're recording. When the recording is finished, a File Save dialog will appear for you to name the file and path. The file is renamed and moved.

There are few issues that should be aware of as you consider AVI recording:

- **A smaller Terrain window results in a smaller AVI file**.

- **A smaller Terrain window allows faster AVI capture**. Unfortunately, the speed at which the terrain is being rendered depends on the complexity of the model (the size of the dataset).
- AVI recording is **unavailable in the Full Screen Display**.
- **AVI recording is a CPU intensive operation**, much like terrain rendering. Thus, when the AVI is being recorded, the rate at which terrain windows present a complex terrain model will inevitably be lower than usual. You may see now difference even when using simple models depending on your hardware capabilities.
- **3DTV only records changes in the window from which contents are being captured.** Thus, for example, if the camera holds still, the AVI file will be quite small.

Optimizing 3D Terrain Viewer Performance

A number of options are provided under the View menu that allow you to optimize the function of 3DTV on your computer. You may need to do a bit of experimenting to find the best settings for your equipment.

Graphical User Interface Response Mode

GUI Response mode affects the speed of the response to your interaction with the interface controls versus the speed that the terrain is updated and redrawn when you are using very large data sets.

In **Fast Response** mode, the interface responds immediately while the program simultaneously continues to refresh your terrain when camera moves (e.g. camera control buttons work, terrain picture changes while camera is moving and menu is opened). If you are using a very large data set, the display rate is slightly lower in this mode. Some video cards are unreliable in this mode.

Use the **Safe Response** mode when you load a large data set if:

- You prefer a fast refresh rate in the Terrain window over quick response to your interactions
- 3DTV appears unstable in Fast Response mode.

Buffering in 3DTV

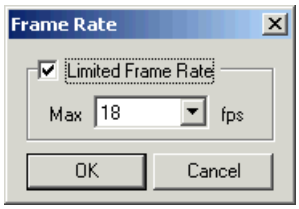
Buffering offers options for the speed that the program can redraw the data in a window that has been repositioned or restored after minimizing or hiding.

Fast buffering is the ideal setting, but some video cards cannot perform well under these conditions and may require a slower setting. In this case, try **Safe Buffering** (a medium speed) or **No Buffering** (slowest).

LIMITED FRAME RATE

3DTV typically will consume all of available computer's CPU time resources in order to achieve maximum frame rate. This, in turn, will slow other programs that you may be running simultaneously. You can free some of the CPU usage for use by other programs by limiting the frame rate in 3DTV.

FIGURE 7-58. *Frame Rate Dialog*



Check "Limited Frame" Rate and reduce the number of frames per second. 3DTV will try to achieve desired frame rate if possible, but will not go above defined frame rate.

If the user-defined frame rate is small enough, 3DTV will not spend all available CPU time for drawing terrain windows (scene rendering).

If the user-defined frame rate is too low in Matrix 3DTV mode, a buffer overflow message may occur, because Matrix 3DTV is not able to collect all terrain data changes.

INTERPOLATED POSITION IN 3DTV DISPLAYS

If the 3DTV display in the Terrain window updated at the Record Rate from SURVEY, the vessel would not move smoothly in your display. By default, therefore, 3DTV attempts to predict interpolated positions to smooth the display.

Unfortunately, this process requires significant CPU time. If this is a problem, you can regain CPU time by omitting the interpolation. The VESSELS-INTERPOLATED ANIMATION menu option can be used to toggle the animation on and off.

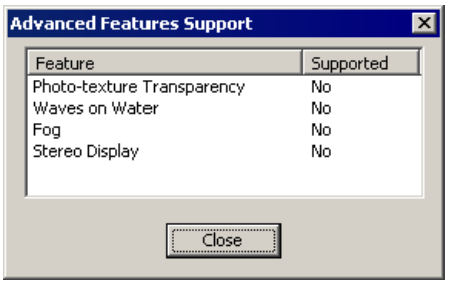
SUMMARIZING THE HYPACK® COMPUTER DISPLAY COMPONENTS

Some of the graphics features included in the 3DTV module (phototexture transparency, waves on water, fog) may fail either because your computer graphics configuration doesn’t support the technology used or due to the particular combination of hardware and software that support graphics display. If you experience such a problem, 3DTV provides some tools that can help determine where the problem lies.

Advanced Features Support

To determine if your system graphics supports the advanced graphics features in 3DTV select HELP-ADVANCED FEATURE SUPPORT. A window will appear with a list of the advanced graphics features and whether your system supports them.

FIGURE 7-59. *Sample Advanced System Features Dialog*



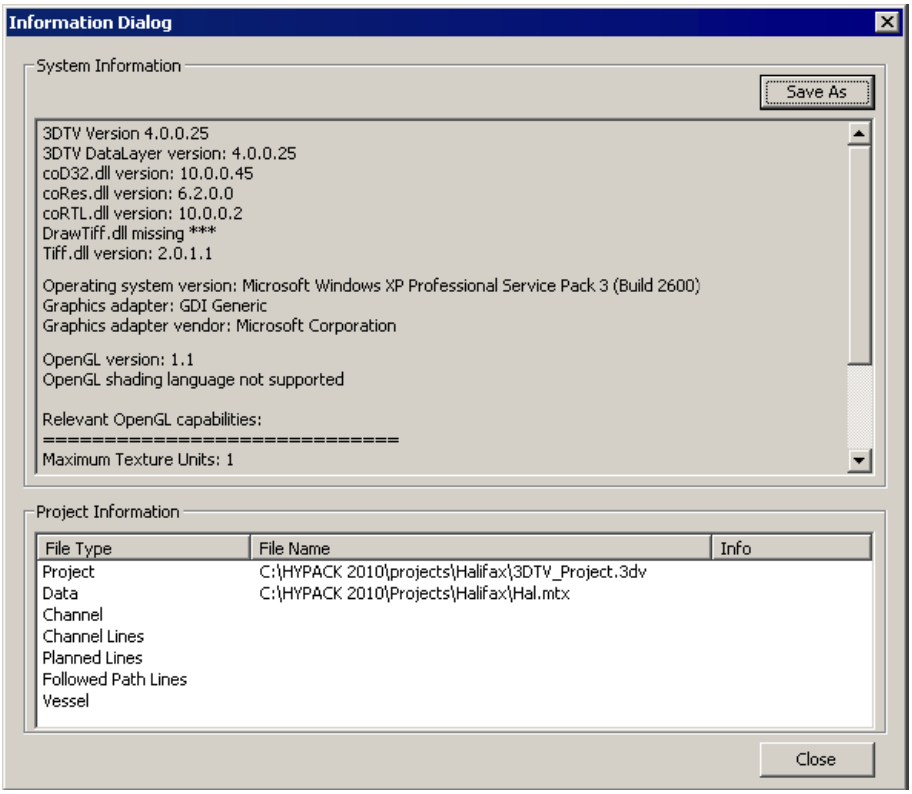
System and Project Information

3DTV provides a utility that scans your computer and compiles a list of the various hardware and software components that affect the display capabilities in 3DTV. It includes items suchs as all HYPACK® files used to draw the 3DTV displays with their version numbers, OpenGL version information, operating system and graphics adapter information.

In addition to the system information, this dialog has a Project Information display which lists the 3DTV project file (*.3DV) and the names of any HYPACK® project files included in your display.

To compile the list of display components, select FILE-INFORMATION.

FIGURE 7-60. *InformationDisplay*



With this information, we may see that a simple file update can correct your display. If your display is still incorrect, please forward the compiled list to HYPACK® Technical Support (help@hypack.com) so we can attempt to determine and correct the cause.

To export the system information to a text file, click [SaveAs] and name the file.

ARCHIVING 3DTV PROJECTS

Archiving projects with 3DTV displays can be a complex and time-consuming task because of all of the files that may reside outside of the project directory which also need to be transferred.

Normally, you would have to manually transfer 3OD files and any other files stored outside the project folder to the target computer It would also require that each file have the same path as they had on the source computer. In addition to being inefficient, this process has a high probability of error. 3DTV's 'Pack' and 'Unpack' routines solve all of these difficulties.

The **Pack** routine packages the 3DTV settings file (*.3DV) along with all of the project and data files included in the display to an information packet file (*.3DP) which can be saved to the location of your choice.

The **Unpack and Open** routine reads the archive package. It asks for the folder where the archive is to be unpacked, then saves the project (3DV) and color (HCF) files in that folder. It also creates a subfolder named *ProjectName* files where all of the remaining files from the packet are stored. After unpacking, 3DTV will automatically open the unpacked 3DTV display.

CHAPTER 8

Utilities

TIDE (WATER LEVEL) CORRECTIONS

There are several ways to incorporate your Tide Corrections into your data set. These include the following:

- **Log the data from a telemetry tide gauge** in real time in the SURVEY program.
- **Manually enter the corrections in real time** in the SURVEY program.
- **Create a Tide Correction file** using:
  - **Harmonic predictions** in the HARMONIC PREDICTION program.
  - **Predicted high-low water times** in the MANUAL TIDES program.
  - **Actual tide levels and times** in the MANUAL TIDES program.
- **Recalculate RTK tide corrections from the RAW strings** in your single beam or multibeam data in the editor programs.
- **Interpolate tide corrections** based on the vessel position relative to pairs of tide stations along a tidal river using the Tide Adjustments tool in the editor programs.
- **Tide Zones** apply a time offset and magnitude multiplier according to based on the tidal zone around the tide gauge in which the sounding falls.

The important thing to remember in all of these methods is that the *Tide Correction is added to the raw sounding*. Tide Corrections relate raw soundings to the chart (low water) datum. Since you normally want to remove the water column above the sounding datum, *the overwhelming majority of the time your tide corrections will be negative numbers*! The HARMONIC PREDICTION program takes care of this automatically. You have to make some mental adjustments when entering tidal heights in the MANUAL TIDES program.

- When creating a tide file for **depth mode**, enter tide values as *negative numbers*.
- When creating a tide file for **elevation mode**, enter tide values as *positive numbers*.

Tide corrections are measured in survey units.

Any sounding collected before the first time of your *.TID file will get the value of that first time. Any sounding collected after the last time of your *.TID file will get the value of that last time.

If you read tides from a telemetry gauge or if you manually entered them while collecting survey data in the SURVEY program, you can skip this section. When you start the single beam and multibeam editors, it will have all of the information it needs to compute tide corrections for each sounding.

HARMONIC TIDAL PREDICTIONS

We don't intend to teach you about Harmonic Tidal Predictions and harmonic constituents. All we want to do is show you how to create a Tide Correction file (*.TID) using the HARMONIC PREDICTION program.

The routines in this program are taken from the British Admiralty publication N.R.203. It uses combined constituent data for M2, S2, O1, and K1. This means that the minor constituents of them are combined into these four values. The harmonic constituents published by the French hydrographic authorities take a slightly different approach, so they won't give the correct answer if you plug them into these formulae.

In order to compute a harmonic tidal prediction, you need the following information:

- The harmonic constituents for the desired port
- The day factors (0000H) for the day in question
- The day factors (0000H) for the next day

It needs the day factors. for both days in order to perform an interpolation throughout the day. All of these constituents and factors are published in the British Admiralty publication N.R.203. It comes out every year and is divided into three volumes. One is for the Atlantic Ocean, Caribbean, and Mediterranean. The second is for the Pacific Ocean. The third is for the Indian Ocean ports. You can buy these from your Admiralty chart agent.

RUNNING THE HARMONIC TIDES PROGRAM

1. **Start the program** from the tides icon or by clicking PROCESSING-TIDES-HARMONIC TIDES. The Harmonic Tides dialog will appear.

2. **Enter the necessary information**.
   - The Date for Prediction, Site for Prediction, Mean Level and Seasonal Correction come from the Port Factor page.
   - Enter the Harmonic Constituents for the port.
   - Enter the day factors (0000H) for the day of the prediction
   - Enter the day factors (0000H) for the day after the prediction
3. **Save the input data** by clicking [Save Tide Ref].
4. **Click on [Compute And Graph].** A graph of your tide corrections over a 24 hour period will appear. You can return to the spreadsheet to recheck your data by clicking [Exit] or continue on.
5. **Save your corrections** by clicking on [Save To *.TID]. You will be asked for a name for the Tide Correction file. Give it a name you can remember, one that reminds you both of the area and the day for which the corrections are made.

In the input dialog:

- **[Get Last Reference]** reloads the last saved data.
- **[New Prediction]** presents an empty dialog.

In the graph dialog:

- **[Print Graph]** sends the graph display to the Windows® default printer.
- **[Print Corrections]** sends a copy of your entries in the spreadsheet and a listing of time ranges and their predicted tide corrections over the specified time range.

HARMONIC TIDES EXAMPLE

Example: Harmonic Tides

Perform a harmonic prediction for the port of Boston, using the following information.

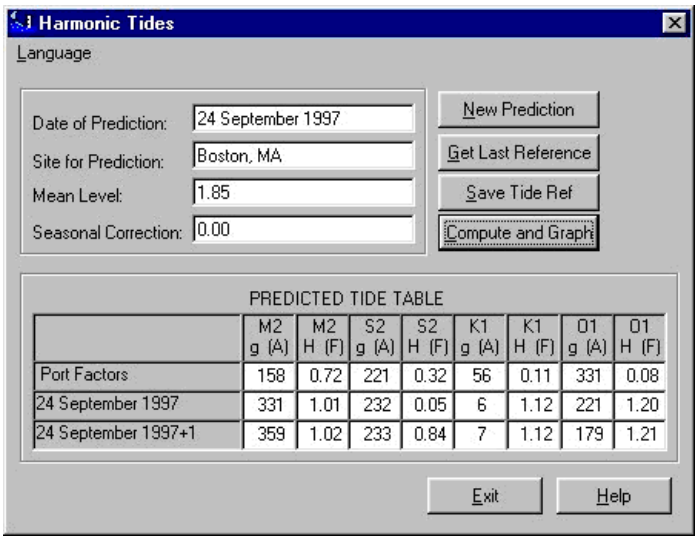
Date:24 Sept 97
Site:Boston, MA
Mean Level:1.85
Seasonal Level:0.00

Item	M2-g	M2-H	S2-g	S2-H	K1-g	K1-H	O1-g	O1-H
Port	158	0.72	221	0.32	56	0.11	331.	0.08
24 Sept.	331	1.01	232	0.05	6	1.12	221	1.20
25 Sept.	359	1.02	233	0.84	7	1.12	179	1.21

Solution:

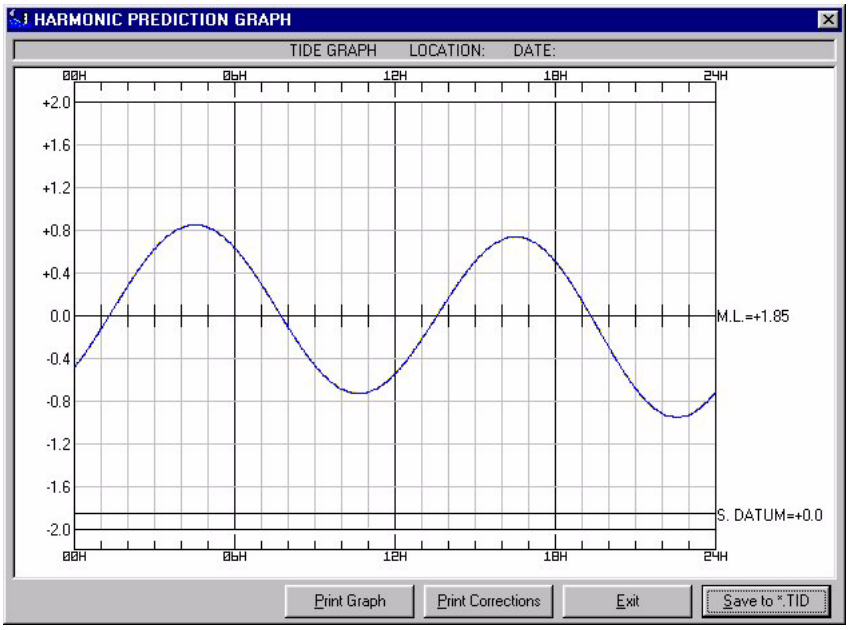
1. **Start the program.** Click on PROCESSING-TIDES-HARMONIC TIDE. The spreadsheet will appear.
2. **Enter the information into the spreadsheet**.

FIGURE 8-1. *Harmonic Tides Spreadsheet*



3. **Save the input data** by clicking [Save Tide Ref].
4. **Click on [Compute and Graph].** The program will calculate a predicted tidal value for every minute of the day. The information will be drawn to a graph as shown below.

FIGURE 8-2. *The Predicted Tide Graph in the Harmonic TIDES Program.*



5. **Click on [Save To *.TID]** and name your Tide Correction file. Give it a name that reminds you of both the site and the day of the correction. In our case we have named it BOS0924.TID. The program will automatically assign the extension .TID to any name you give, and save the file in the project directory.

The key thing to remember about harmonic tides is that they are only predictions. Meteorological effects can cause drastic changes to the actual water levels.

MANUAL TIDES PROGRAMS

There are two MANUAL TIDES programs used to generate tide corrections files:

- **MANUAL TIDES** spans a single day.
- **MANUAL TIDES MULTI-DAY** spans multiple days.

In the MANUAL TIDES programs, you will enter a series of dates, times and tide correction values spanning the time of your data collection. The programs create two files.

- A ***.TDX file** contains the date, time, correction information. It is used to repopulate the spreadsheet if you want to reload it in MANUAL TIDES.
- A ***.TID file** contains the tide correction value for every minute of each day. It is used in the editing programs to correct your Raw data for changing water levels.

Your tide corrections will almost always be negative numbers because HYPACK® *adds* your tide correction to the raw sounding, but you are *removing* the water column from your sounding value.

TIDE CORRECTIONS FROM HIGH-LOW WATER TIMES AND HEIGHTS

1. **Open the MANUAL TIDES program** by selecting PROCESSING-TIDES and MANUAL TIDES or MANUAL TIDES MULTI-DAY. The Manual tides dialog will appear.
2. **Enter the dates, times and height data for the period of your survey.** MANUAL TIDES MULTI-DAY can create tide files spanning multiple days.
   - **In MANUAL TIDES**, you may enter one tide value each from the day before and from the day after your survey date to assure accuracy on either side of midnight. The previous day is listed first with a negative time. The following day is listed with a "+" preceding the time.
   - **In MANUAL TIDES MULTI-DAY**, enter the dates in mm/dd/yyyy format.
3. **Select Min-Max**. This tells the program to use the high water-low water prediction algorithm developed by NOAA. The program calculates a tide height for every minute of the day. The results are graphed on the right. In MANUAL TIDES MULTIDAY, you can use [Previous Day] and [Next Day] to view the graph for each day.

4. **Save your file** by clicking on FILE-SAVE and giving your file a name. Make sure the name is chosen to remind you of both the site and the dates of the correction. The TID and TDX file pair will be saved to your project directory.

NOTE: If you are using the NOAA tide book and you are working in depth mode, place a minus sign in front of all of your height entries. For example, if the NOAA book shows a high tide that is 5.6' above gauge, you need to remove 5.6' from the water column. You, therefore, must enter -5.6' in HYPACK®.

The following is an example of using MANUAL TIDES with High-Low Water Times and Heights

Example: Creating Tide Files using MANUAL TIDES

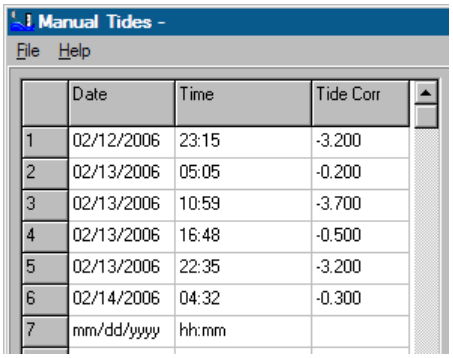
Create a Tide Correction (*.TID) file using the following information from the NOAA book.

Solution:

Day	Time	Height
February 12	23:15	3.20
February 13	05:05	0.20
	10:59	3.70
	16:48	0.50
	22:35	3.20
February 14	04:32	0.30

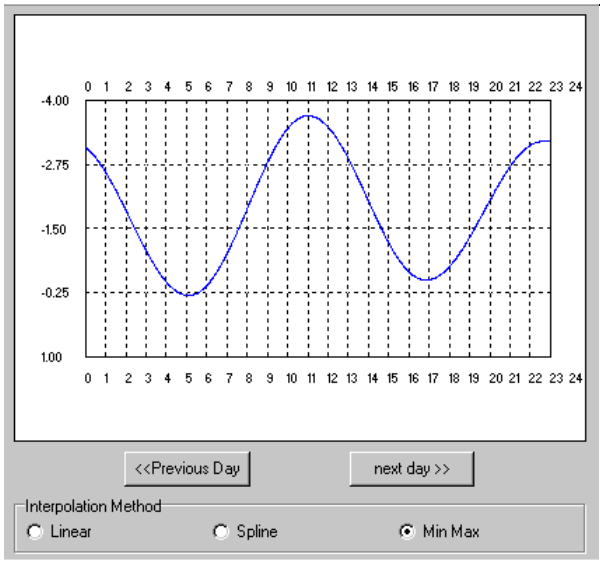
1. **Open the MANUAL TIDES MULTIDAY program and enter the data** so it looks like the figure below. All of the NOAA heights have a minus sign placed in front of them because we want to remove the water from the sounding.

FIGURE 8-3. *Entering data for High-Low Waters*



2. **Click on Min-Max.** Your graph will be drawn as shown on the right side of the dialog .

FIGURE 8-4. *Tide Graph*



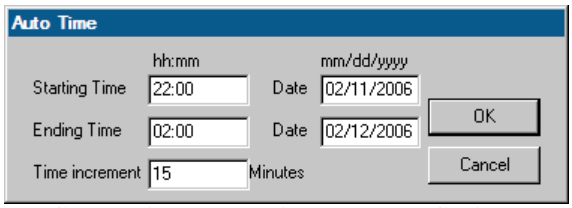
3. **Save your file** by clicking on FILE-SAVE and save the file to "BOS_1125.TID".

TIDE CORRECTIONS WITH MANUAL OBSERVATIONS

1. **Open the MANUAL TIDES program** by clicking PROCESSING-TIDES-MANUAL TIDE or from the TIDES icon.
2. **Enter the time and tide correction pairs in the grid.** A handy feature with the MANUAL TIDES program is the AutoTime feature. Enter a Starting Time and Ending Time, along with a time increment, click [OK] and the program will automatically fill the time column with the requested times.

It works best to include a tide reading from before you start your survey and one after you finish so the program can finish the tides for the period of survey.

FIGURE 8-5. *Auto-time Dialog*



3. **Select either the Linear or the Spline method**. The Spline method fits the curve through your data points.

NOTE: You need at least five points to run the spline algorithm.

4. **Save your tide corrections**. The MANUAL TIDES program saves your table of data to a *.TDX file and your tide corrections to a *.TID

file. The TDX file allows you to later retrieve the tide table should there be any questions about what values were used. The TID file is used in post-processing to correct your soundings.

The following is an example of using Manual tides with observed high low water values.

Example: Manual Tides

During the day, our crackerjack tide staff reader made the following readings of times and gauge heights.

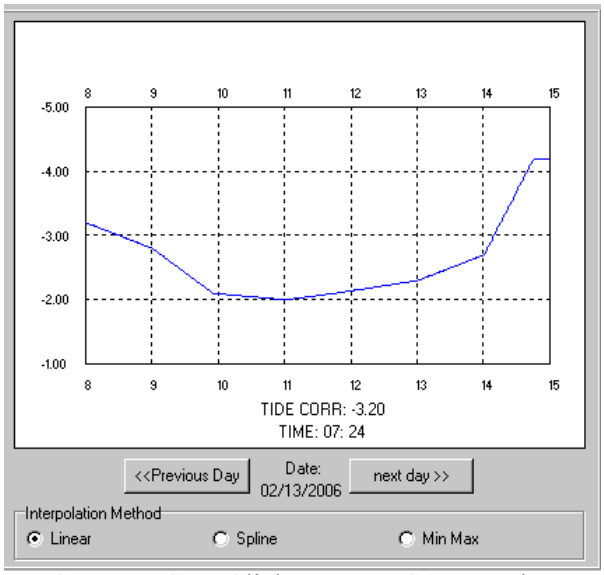
Time	Gauge Height
08:00	-3.20
09:00	-2.80
09:55	-2.10
11:00	-2.00
11:45	-2.10
13:00	-2.30
14:00	-2.70
14:45	-4.20

Your mission is to make a *.TID file named “TideData.TID”, using a straight-line interpolation between the points. Once you’re done, click on [Spline] to see what it looks like.

Solution:

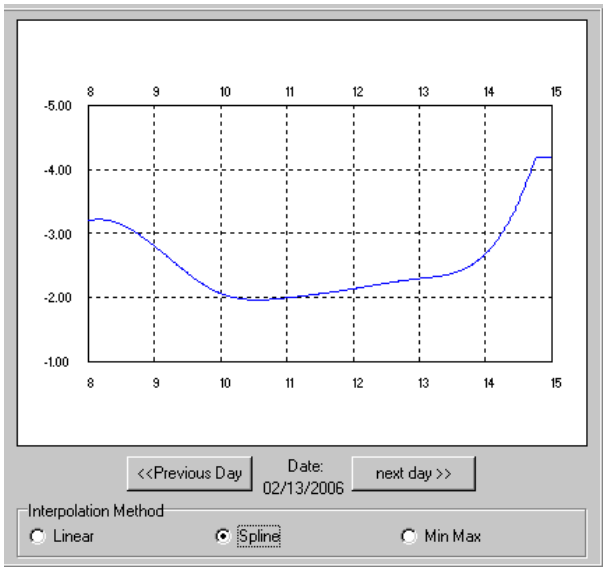
1. **Open the MANUAL TIDES program** by clicking PROCESSING-TIDES-MANUAL TIDE or from the TIDES icon.
2. **Enter the values as given above.** Since we are given the height of the water above the gauge zeros, we have to enter the correction values as negative numbers.
3. **Click on [Linear]** and the points will be connected with a straight line.

FIGURE 8-6. *Tide Data with Linear Interpolation*



1. **Save the file.** Click on FILE-SAVE and enter the file name. It will save the table data to the TideData.TDX FILE and the tide corrections to the TideData.TID file.
2. **Click on [Spline].** Your graph should now look like the following figure.

FIGURE 8-7. *Tide Data with Spline Interpolation*



IMPORTING NOAA TIDE DATA TO MANUAL TIDES PROGRAM

Historical water level data can be obtained from NOAA's website and imported into the Manual Tides Program.

1. **Down load the pertinent data from NOAA's website**.

a. **Go to http://tidesandcurrents.noaa.gov/nwlon.html and select either Tide Stations or Great Lakes Stations** from the navigation bar according to where you are working.
b. **Select the tide station** nearest you.
c. **Enter the dates** for which you want data from that tide station.along with the correct datum, distance units and time zone.
d. **Click [View Data]** and the information will load in your browser window.
e. **Save your file.** Select FILE-SAVE AS in the Microsoft Internet Explorer or Netscape Navigator menu and name your file, changing the file extension to "txt".

2. **In the MANUAL TIDES program, click [NOAA] and select the downloaded text file**. A dialog will appear with a list of dates found in the file.
3. **Select a date in the window** and click [OK] (or use a double click when selecting the date). Tide corrections are inverted from the NOAA file for compatibility with our software.

Editing Tide Files in the Manual Tides Program

Tide Files (*.TID) that have been created in the MANUAL TIDES program may also be edited in MANUAL TIDES.

1. **Open the MANUAL TIDES program** by selecting PROCESSING-TIDES-MANUAL TIDES.
2. **Select the file to edit** by selecting FILE-OPEN and choose the *.TDX file of the same name from the file manager
3. **Make any changes and save your file.** Changes will be saved, both to the *.TID File and the *.TDX File.

Tidal Zoning

For several years, HYPACK® users have interpolated tide corrections based on the vessel position relative to two tide stations along a tidal river. The TIDAL ZONE program adds another dimension to this concept applying a time offset and magnitude multiplier to each tide correction based on the tidal zone in which the sounding falls.

A **Tidal Zone** is an area in which the soundings should receive similar tide correction values. They can be in whatever shape, size and number that is appropriate for the conditions in your survey area. Each zone is initially defined by a time offset and magnitude multiplier pair. These values are further interpolated by the TIN MODEL program to provide smooth transitions between tidal zones.

The TIDAL ZONE program calculates the final tide correction for each sounding based on:

- Sounding Position
- Adjustment Factors (time offset and magnitude multiplier) for the sounding position.
- Sounding Time

In addition to the usual tide correction file (*.TID) for your local tide station, you will create two TIN models, one containing time offsets and one containing magnitude multipliers for the zones included in our survey area. The TIDAL ZONE program refers to these models to get a pair of adjustment factors based on the position of each sounding. It uses these values to calculate the tide correction value as follows:

1. **It adjusts the time of the tide correction**. TIDAL ZONE refers to the time offset TIN and finds the time adjustment value based on the position of the sounding. It then calculates a new tide time by *subtracting the time adjustment from the sounding time tag*.
2. **Gets a tide correction value from the TID file** *for the adjusted time*.
3. **Applies the magnitude multiplier to the tide correction**. TIDAL ZONE refers to the magnitude multiplier TIN to determine the multiplier appropriate to the position of the sounding, multiplies it with the value from the TID file and stores the result as the final tide correction.

For example, Zone 1 has a 24 minute time offset and a .92 multiplier. For a sounding taken at 11:00AM, TIDAL ZONE would adjust the time to 10:36 and look up the corresponding tide gauge reading in the TID file. For this example we'll use 2.00 feet above gauge. The program would then multiply that by .92 to get a final tide correction of 1.84 feet above gauge to be used at our sounding location. Since the tide corrections are added to our raw soundings in HYPACK®, our actual correction would be -1.84 feet.

In RAW Format Files, for each position record (POS), the program will store the final tide correction to a TID record. If you have alternate tide information from a telemetry tide system, RTK Tides, or manually entered tide corrections, they will be maintained as separate records in the raw file with a different device ID. When you read the data into the editing program, you can choose which set of tide corrections you want to apply through the Read Parameters dialog of the editing program.

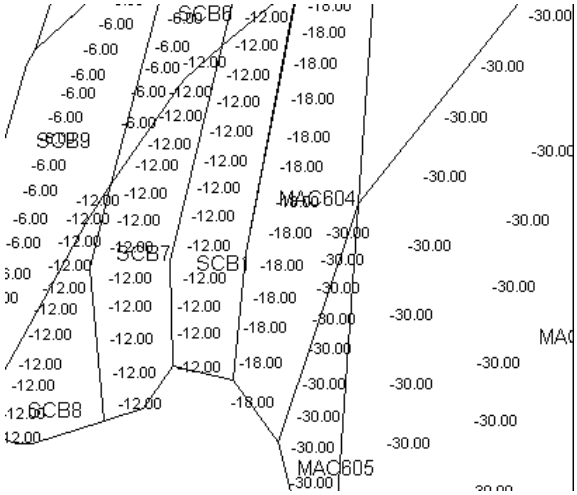
In ALL Format Files, the program creates new ALL format files, using a user-defined naming convention, and writes the final tide correction in the Tide field of each record.

CREATING TIDAL ZONES

Before you can apply tide corrections using the TIDAL ZONE program, you have to prepare the TIN models which determine the adjustment factors.

1. **Create a background file outlining your tidal zones** as a temporary guide. You can create a DXF or DGN file in an external CAD package and import it to HYPACK® as a background file.
2. **Define the adjustment factors for each zone**. XYZ files, which normally contain 3-dimensional position information, in this context associate the adjustment factors with their XY positions. Use the XYZ COLLECTOR to create two files—one containing X, Y, Time Offset data and the other with X, Y, Magnitude Multiplier data for each zone.

FIGURE 8-8. *Sample Time Offset XYZ Overlaid on the Tidal Zone Background File*



There is not very much precision required here. It is important, however, to construct the files in a way that the TIN models built with them will accurately guide your corrections. Keep in mind that the TIN models will interpolate between different Z-values. In the previous figure, for example, if a sounding were to fall on the line between zone SCB1 and MAC604, the time offset would be about -15—the interpolated value for a position about half-way between -12 and -18. (It might help to envision your Z values as depths and treat them as contours. Think about creating "slopes" rather than "steep cliffs".)

- **If your zone is long and narrow**, collect a series of records down the center of the zone.
- **If your zone covers a wider area**, collect enough samples to cover the area.

3. **Save each XYZ file to your project.** By default, the XYZ COLLECTOR saves them to the Sort directory but, because these files are not sorted sounding files, they can be stored anywhere.

4. **Build a TIN model with each XYZ file** and name it in the format *TideGaugeName_Content.*TIN (Ex. JamesRiver_Times.TIN).

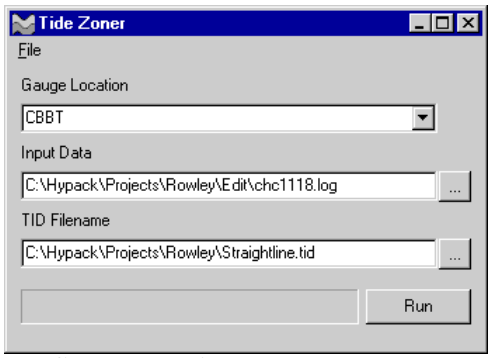
NOTE: Though the TIN MODEL program will default to the project directory when you save it, for the TIDAL ZONE program to work correctly, these TIN models *must* be saved to the \Hypack\TideModel folder.

APPLYING TIDE CORRECTIONS USING THE TIDAL ZONE PROGRAM

Once you have created the TIN models with the adjustment factors for your project area, Onthe TIDAL ZONE program can calculate tide corrections for either Raw or All format files.

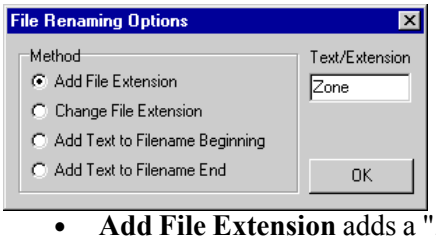
1. **Launch the TIDAL ZONE program** by selecting PROCESSING-TIDES-TIDAL ZONE. The TIDAL ZONE dialog will appear.

FIGURE 8-9. *The Tidal Zone Dialog*



2. **Select your input data**.
   - **Gauge Location** is populated by the beginning portion of the TIN file names stored in the \Hypack\TideModel directory. Select the tide gauge location on which your tide correction file is based.
   - **Input Data** is the Raw or All format file for which you want to calculate the tide corrections. You can enter an individual file or a catalog file. Use the […] to browse for the desired file.
   - **TID File Name** is the tide correction file for the specified gauge covering the time span of your data collection.
3. **Set your export options.** Select FILE-EXPORT OPTIONS, set your file renaming options and click [OK]. The export options include a user-defined text string, and how it will be used in the names of the output files.

FIGURE 8-10. *Tidal Zone Export Options*



- **Add File Extension** adds a "." followed by your text to the end of your text name. Ex. 041_1322.edt.new, FirstOne.log.new.log
- **Change File Extension** replaces the original extension with the text. Ex. 041_1322.new, FirstOne.new.log
- **Add Text to Filename Beginning** begins each file name with your text. Ex. new041_1322.edt, newFirstOne.log
- **Add Text to Filename End** inserts the text string after the filename just before the existing extension. Ex. 041_1322new.edt, 041_1322new.log

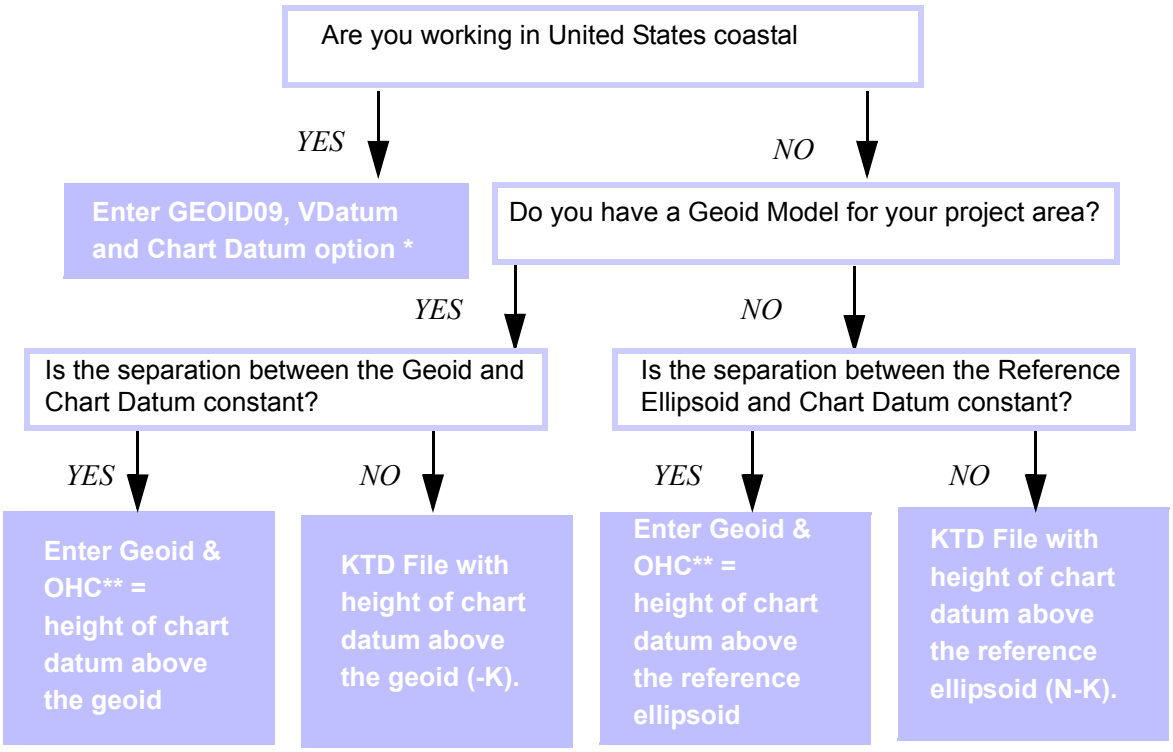
4. **Click [Run].** The TIDAL ZONE program will calculate the tide correction value for each sounding in the file and write them to new files named according to the specified export options.

REAL TIME KINEMATIC (RTK) TIDE CORRECTIONS

Real Time Kinematic (RTK) GPS receivers can measure the latitude, longitude and height above the WGS-84 reference ellipsoid to within a few centimeters. Using this vertical accuracy, you can determine water level corrections (tide corrections). This eliminates the need to use conventional tide gauges or to assign personnel to monitor tide staffs.

1. **Establish an RTK base station** to supply differential corrections to the boat-GPS.
2. **Set your height correction options** in GEODETIC PARAMETERS according to the following chart:

FIGURE 8-11. *Configuring your Geodesy for RTK Tide Corrections*



* **When using the VDatum database**, *you must use one of the pre-defined chart datums.* If you enter a user-defined chart datum level, the VDatum database is ignored.

** **OHC**: Orthometric Height Correction in survey units. this value can be used to adjust HYPACK® so the tide values to match your tide gauge.

3. **If a KTD file is required, create it in the KTD EDITOR and enable it in your project.** When you open the SURVEY program, the driver will read the first enabled KTD file in your project.

   NOTE: If you are using the VDatum database, be sure there is no enabled KTD file. *If you have an enabled KTD file, the VDatum setting will be ignored.*

4. **In HYPACK® HARDWARE, use the GPS, PosMV or F180 driver to configure your GPS**.
   - **Check the Tide function in the Device Setup** window. This tells the driver to perform the calculation to obtain a real time tide correction.
   - **Specify the antenna height** above the static water line in the Offsets.
   - **If you are working without a KTD file,** account for your separation value in the GEODETIC PARAMETERS program. HYPACK® provides two methods:
     - Use an Orthometric Height Correction

- If you are working in United States on coastal waters or on the Great Lakes, load the Geoid with the VDatum for your project area.

Beware!

BEWARE! In earlier HYPACK® versions, you could do this by entering the value of your antenna height minus the height of the ellipsoid above chart datum as the antenna height in the Offsets window in HARDWARE for the GPS driver. Beginning with the release in 2006, this will not work correctly because of the change in the conventions involving the Z-Axis.

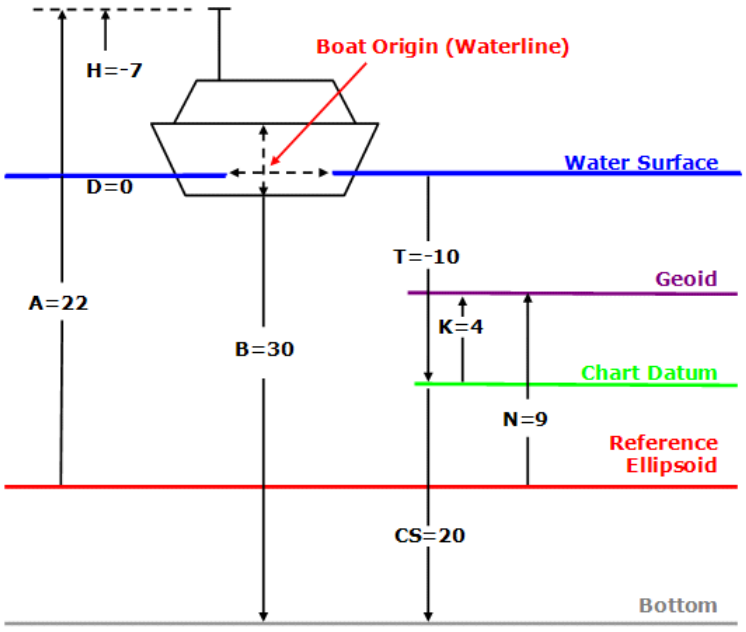
5. **Calibrate your echosounder** so the depth sent to the computer includes the measured depth from the transducer to the bottom, plus the transducer draft correction. (This means that you do not enter draft corrections manually or automatically through the drafttable.dll for single beam data or the Squat/Settlement Table for multibeam data.)
6. **In the single beam or multibeam editing programs, select RTK Tides and how you want the editor to handle heave data** in the Advanced Read Parameters dialog. The editing programs read the raw format data file and use the tide records contained in the file automatically.

NOTE The SINGLE BEAM EDITOR and HYSWEEP® EDITOR include routines that enable you to recalculate RTK tide correction values for each sounding *if you record raw GPS messages.*

RTK METHODOLOGY

The following figure shows all of the components needed to compute the Chart Sounding (CS = the distance of the bottom below the Chart Datum).

FIGURE 8-12. *Obtaining Real Time Water Levels*



Using conventional survey techniques we have always added the various corrections to the measured depth from the echosounder to obtain the chart sounding. In this example, we have calibrated our echosounder to the surface. The formula would be:

$$CS = B + T_C + D$$

$$CS = 30 + (-10) + 0 = 20.0$$

where: T_C = Conventional Tide Corr.

B = Measured Sounding

D = Dynamic Draft Meas.

The idea behind the computation of RTK Tide is that we can use the z-value of our GPS antenna to determine the tide correction in real time. Assuming the vessel is not pitching and rolling (which adds another level of difficulty), we can compute the RTK Tide Correction (T_R) as follows:

$$T_R = -K + N - A - H - D$$

$$T_R = -4 + 9 - 22 - (-7) - 0 = -10$$

where: K = Height of the Geoid Above the Chart Datum

N = Height of the Geoid Above the Ellipsoid Reference

A = Height of the RTK Antenna Above the Ellipsoid Reference

H = Height of the RTK Antenna Above the Boat Origin Point

NOTE This value should almost always be negative as the antenna is above the water line.

D = Dynamic Draft Measurement

K comes from a KTD (Kinematic Tidal Datum) file you create in the KTD EDITOR or, *if you are working in the United States,* you can use the NOAA VDatum database (incorporated into your HYPACK® install). Measurements are in depth units as set in your geodetic parameters.

- **If you are using a geoid model** you have two choices:
  - Enter the height of the geoid above the chart datum (K) in your KTD file.
  - Select the VDatum zone for your project area in your geodetic parameters.

NOTE: If a VDatum is selected, HYPACK® will ignore any KTD files in your project.

- **If you are not using a geoid model**, enter the height of the reference ellipsoid above the chart datum (K-N).

N is the height of the Geoid above the Ellipsoid (as read from the Geoid model in real time) plus an orthometric correction specified in the GEODETIC PARAMETERS program. If you are not using the geoid model, N=0.

A is the height of the antenna above the reference ellipsoid. This is broadcast as a part of a GGA, GGK or other message from your RTK system.. Every time the GPS.dll or Kinematic.dll device driver receives a position update, it computes the new position, along with a new RTK Tide value.

H is the static height of the RTK Antenna above the water line. In order to maximize accuracy, this measurement should be taken at the same time you calibrate your echosounder to the surface. In theory, this should be measured to the same point (boat origin = static waterline) that you are using to calibrate your echosounder. In actual practice, it's not practical to measure the antenna height out in the middle of the channel when you are doing a bar check.

We suggest that you measure the antenna height when the vessel is at the dock and place a mark on the hull to denote the static waterline. Then make an adjustment to the antenna height when you calibrate the echosounder by noting the change in height of the waterline relative to the mark.

D (Dynamic Draft) represents the vertical movement of the transducer in the water column. If you are using RTK tides with HYPACK® (which

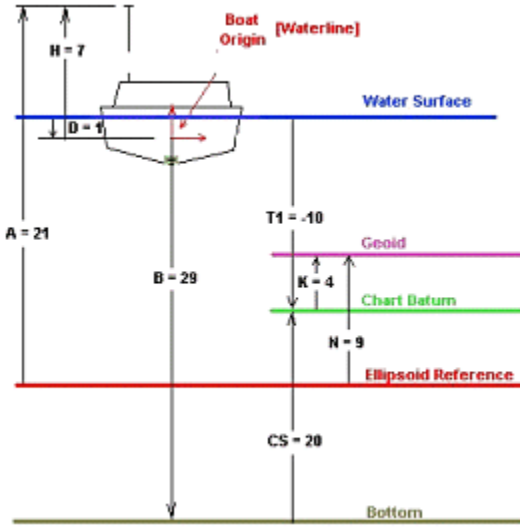
presumably you are since you're reading this) *you do not need to enter any draft corrections.*

The device driver subtracts the dynamic draft correction to compute the "true" tide correction. Without a draft correction, the driver will still calculate a correct chart sounding, but the RTK Tide value will be different from the conventional tide value.

For example: In the previous figure, draft=0 and the RTK tide value is calculated to be –10.0 and the CS=20.

Now add a draft value of D=1, but do not provide a draft correction.

FIGURE 8-13. *RTK setup with draft*



The calculations then become:

$T_R = 9 – 4 – 22 – (-7) – 1 = - 9.0$

$CS = 29 + (-9) + 0 = 20.0$

If your vessel is prone to squat and settlement or sits differently due to fuel loading, we suggest that you let your RTK system calculate the tides for the best accuracy.

USING KTD FILES

A KTD file is used in cases where the separation between the two surfaces actually changes, depending on your location.

Use the KTD EDITOR to generate your KTD file. SURVEY automatically loads a KTD file enabled in your Project Files list.

You do not need to make a KTD file if:

- the separation between your reference ellipsoid and chart datum is a constant.

- you are surveying in a small area and only want to use a single separation value.

The values in the KTD file differ depending on whether you are using a geoid model.

If you are using a geoid model, the KTD file contains the height of the geoid above the chart datum (K).

NOTE This means that the first time you survey an area using a geoid model, you must create a new KTD file.

If you are not using a geoid model, the KTD file contains the height of the reference ellipsoid above the chart datum (N-K). This is the same value as you would have used in HYPACK® versions earlier than 2.12.

DETERMINING THE VALUES FOR THE KTD FILE

Before you head out on the water to start your survey, create your KTD File.

If you are not using a geoid, determine the height of the chart datum above the WGS-84 reference ellipsoid. (This is the same process used in HYPACK® versions before 2.12.)

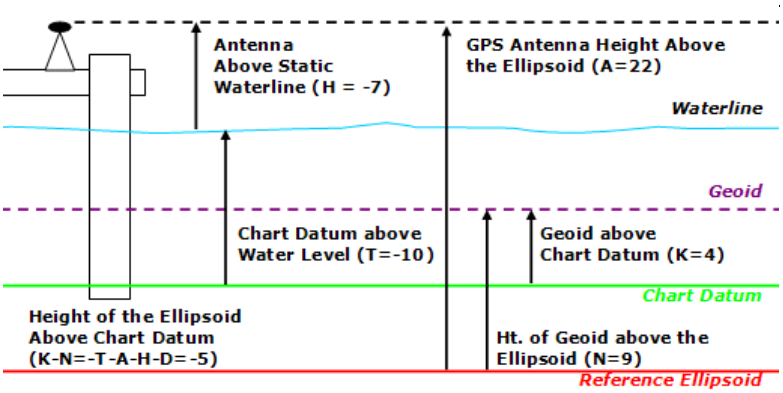
If you are using a geoid, determine the height of the geoid above the chart datum (K).

Measurements are in depth units as set in your Geodetic Parameters.

If your survey is conducted in a small area, you may need only a single point. If your survey is conducted over a large area where the separation between the ellipsoid and chart datum changes, you will need several points to "model" the difference.

The following steps should be taken at each location to determine the KTD values.

FIGURE 8-14. *Determining your KTD value*



1. **Set up your GPS adjacent to your tide staff**. The staff should be referenced to the local chart datum.
2. **Write down the water level from the tide staff** (T).
3. **Measure the distance from your GPS antenna to the water level surface** (H).
4. **Once your GPS is stable and in RTK mode, write down the height of the GPS antenna above the reference ellipsoid (A)**. This is normally contained in the GGA and GGK messages. It might also be available on the front data display of some GPS. You should take care to note whether your GPS provides this value in feet or meters. If you are measuring depths in feet, you will need to convert the ellipsoid height of your antenna to feet. (1 meter = 3.280833333 feet).
5. **If you are using a geoid model, record a reading from your geoid model (N).** This is the height of the geoid above the Reference Ellipsoid.
6. **Calculate the Value for the KTD file**.

If you are using a Geoid Model, use -K:	K = – T – A – H – D + N = - (-10) – 22 –(-7) – 0 + 9 = 10 – 22 + 7 + 9 = 4 KTD value = -4
If you are not using a Geoid Model use N-K:	N – K = A + H + D + T = 22 + (-7) + 0 +(-10) = 22 - 7 -10 = 5

CREATING A KTD FILE IN THE KTD EDITOR

The values in the KTD file differ depending on whether you are using a geoid model.

If you are using a geoid model, the KTD file contains the height of the geoid above the chart datum.

If you are not using a geoid model, the KTD file contains the height of the ellipsoid above chart datum (N-K).

NOTE This means that the first time you survey an area using a geoid model, you must create a new KTD file.

To create your KTD file:

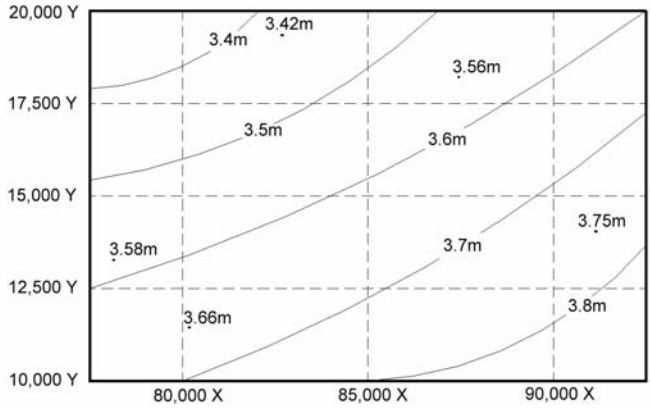
1. **Prepare your data**.
   a. Plot your survey area on a piece of paper.

b. **Plot the location of your tide stations**, where you have determined the separation values. Write the separation values next to each gauge.

c. **Draw a rectangular grid around your survey area**. This is the border of your KTD file. Make a note of the lower left X-Y and upper right X-Y coordinates. They will be needed when you create the KTD file.

d. **Determine how many "nodes" you want in each direction.** The limit is 100 in each direction. See the following sample diagram.

FIGURE 8-15. *Separations: Ellipsoid above Chart Datum*



In this case, there are 3 nodes in the X-direction and 5-nodes in the Y-direction.

e. **Contour the separation data,** as shown in the diagram.

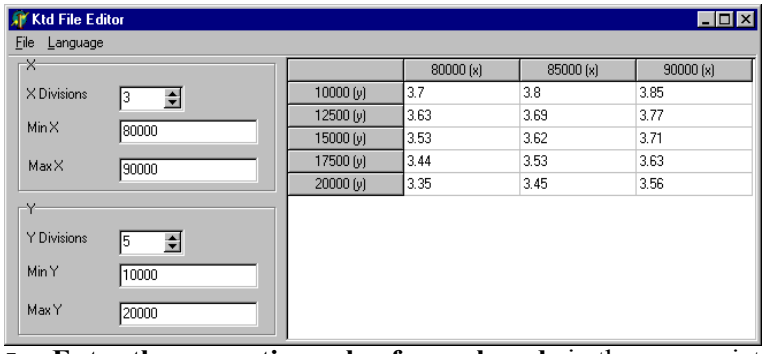
f. **Determine a separation value at each node**, based on the contour information.

2. **Start the KTD TIDE EDITOR** by selecting PREPARATION-EDITORS-KTD TIDE EDITOR.

3. **Enter the maximum and minimum values for your X and Y coordinates.** These were obtained in step 3.

4. **Enter the number of nodes** (or divisions) in each direction. The spreadsheet below will change to reflect the number you have entered.

FIGURE 8-16. *KTD Editor*



5. **Enter the separation value for each node** in the appropriate grid. Measurements are in depth units as set in your Geodetic Parameters.
6. **Save your file by** clicking FILE-SAVE and save the file to a KTD file. KTD files can be saved anywhere, but we normally put them in the \HYPACK\PROJECTS*ProjectName* directory.

OPERATING WITHOUT A KTD FILE

A KTD file is only necessary if you are in an area where the separation between the reference ellipsoid and chart datum is not a constant. If the separation is a constant, or if your survey area is so small, you don't need more than a single value, you can operate without a KTD file. In this case, you would also work without a geoid model.

You can "fool" the system by entering your separation value as an orthometric height correction in the GEODETIC PARAMETERS program.

Beware!

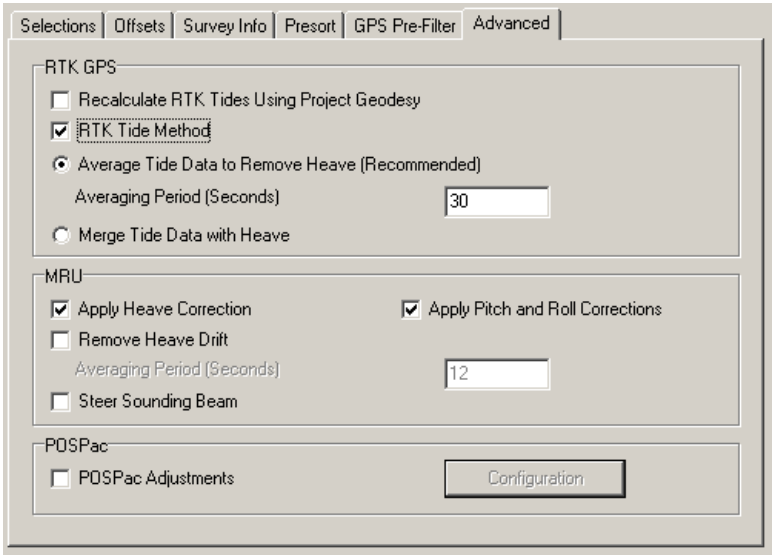
BEWARE! In early versions of HYPACK® Max, you could do this by entering the value of your antenna height minus the height of the ellipsoid above chart datum as the antenna height in the Offsets window in HARDWARE for the GPS driver. Beginning with the release in 2006, does not work correctly because of the change in the conventions involving the Z-Axis.

EDITING RTK GPS DATA WITH WATER LEVEL DATA

Provided you have correctly set up your survey to record real time water level corrections, processing is simple. The single beam or multibeam editing programs can read the raw format data file and use the tide records contained in the file automatically.

The Read Parameters Advanced Tab accesses the RTK Tide parameters.

FIGURE 8-17. *The Advanced Read Parameters Dialog*



If you check the **RTK Tides Method**, editor will then use the RTK tide records written in the raw data file for tide corrections. This will activate the two options on how the program combines RTK water level elevations with heave corrections.

Merge Tide Data with Heave uses the RTK elevations as vertical "anchors". Between the GPS elevation updates, the program "fits" the heave data to predict the change in vessel movement.

Average Tide Data to Remove Heave averages the RTK elevations over a user-defined time period to obtain a "normalized heave plane". In theory, this average vertical level should be the zero plane as defined by the heave-pitch-roll sensor. The program then applies the exact heave corrections to the data to obtain the exact vessel position at the time of the depth measurement.

A time period of 30 seconds seems to work quite well.

Recalculate RTK Tides Using Project Geodesy: Recalculates the RTK tide correction value for each sounding based on the current geodesy settings; the current, enabled KTD (Kinematic Tide Datum) file in your project; and the RAW messages in your raw data files. This option enables you to recover from errors in your RTK configuration including:

- Incorrect geoid model or orthometric height correction
- Incorrect KTD information
- A hardware configuration that excludes the tide function from the GPS configuration.

More Information

- "RTK Tides in the SINGLE BEAM EDITOR" on page 4-24
- "Recalculating RTK Tides from RAW Data in the HYSWEEP® EDITOR" on page 6-13

EDITING RTK GPS DATA WITH CONVENTIONAL TIDES

You can process raw data files that have RTK water level corrections using conventional tides by simply reading a TID file while in the editor. You can, therefore, process the data using RTK water levels or conventional tide corrections, then compare the results in the CROSS SECTIONS AND VOLUMES program (or in the editor profile screen by using the Overlay feature).

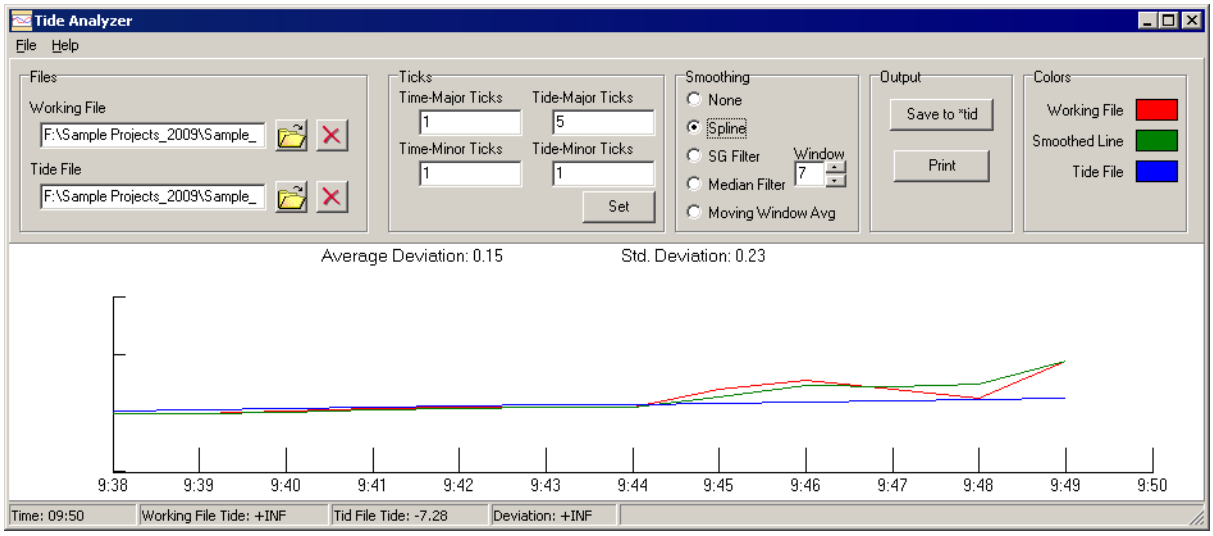
TIDE ANALYZER

The TIDE ANALYZER compares tide corrections in a tide file to those in your data files or in another tide file. You can smooth the data extracted from your working data or tide file. It then displays a graph of the two sets of tide corrections, and compares and calculates the average difference and standard deviation of differences between the data sets.

From the TIDE ANALYZER, you can:

- View the tide value from each data set and the difference between them at the current cursor position.
- View the Average Difference and Standard Deviation of the differences.
- Export the tide corrections from the working file to a TID file.
- Print the graph.

FIGURE 8-18. *Sample TIDE ANALYZER Display*



RUNNING THE TIDE ANALYZER

1. **Open the TIDE ANALYZER** by selecting PROCESSING-TIDES-TIDE ANALYZER.

2. **Load the files from which the TIDE ANALYZER will compare the tide data**. The TIDE ANALYZER can extract the tide data from individual files or catalogs of raw, edited All format, HSX or HS2 data files containing tide correction data, or from a tide correction file (*.TID).

   NOTE: Tide corrections must have been logged to raw or HSX files during SURVEY.

3. **Set your smoothing options** for the tide data from the working file.
   - None
   - Spline
   - Savitsky-Golay
   - Median Filter
   - Moving Window Average
4. **Examine the graph display with the average difference and standard deviation of the differences**.
5. **Export the results of the smoothing to a new tide file**. (Optional)
6. **Print the graph**. (Optional)

TIDE ANALYZER VIEW OPTIONS

The TIDE ANALYZER graphs tide (Y-axis) over time (X-axis). You can configure the frequency of the tics and tic labels on each axis as well as the colors used to graph each set of values.

Tic Settings

Time Major Tics: A longer tic and tic label are drawn on the X-axis at intervals evenly divisible by the user-define value. The minimum value is 1.

Time Minor Tics: A shorter tic is drawn on the X-axis at intervals evenly divisible by the user-define value. The minimum value is 1.

Tide Major Tics: A longer tic and tic label are drawn on the Y-axis at intervals evenly divisible by the user-define value.

Tide Minor Tics: A longer tic is drawn on the Y-axis at intervals evenly divisible by the user-define value.

Color Settings

To set the color for each data set drawn in the graph, click in its color square then select your chosen color from the color dialog that appears and click [OK].

EXPORTING TIDES IN THE TIDE ANALYZER

Once you have extracted the tide corrections data from your working data and chosen your smoothing method, you can export the resulting correction data to a new tide corrections file (*.TID).

Just click **[Save to *tid]**, name your output file and click [Save].

The new tide corrections file will be saved, by default, to a tide file in the project folder.

PRINTING THE TIDE ANALYZER GRAPH

Once you have loaded your data and chosen your smoothing method, you can print the resulting graph.

1. **Click [Print].** The Print dialog will appear.
2. **Select your printer and set your printer properties and click [OK].**

BOAT SHAPE EDITOR

The BOAT SHAPE EDITOR is used to create a custom, true-to-scale boat shape that matches your survey or dredge vessel. Boat shape files are saved by default to the \Hypack\Boat Shapes folder. You may then load a boat shape to represent each mobile displayed in SURVEY, HYSWEEP® SURVEY or DREDGEPACK® to show real time boat position in their displays.

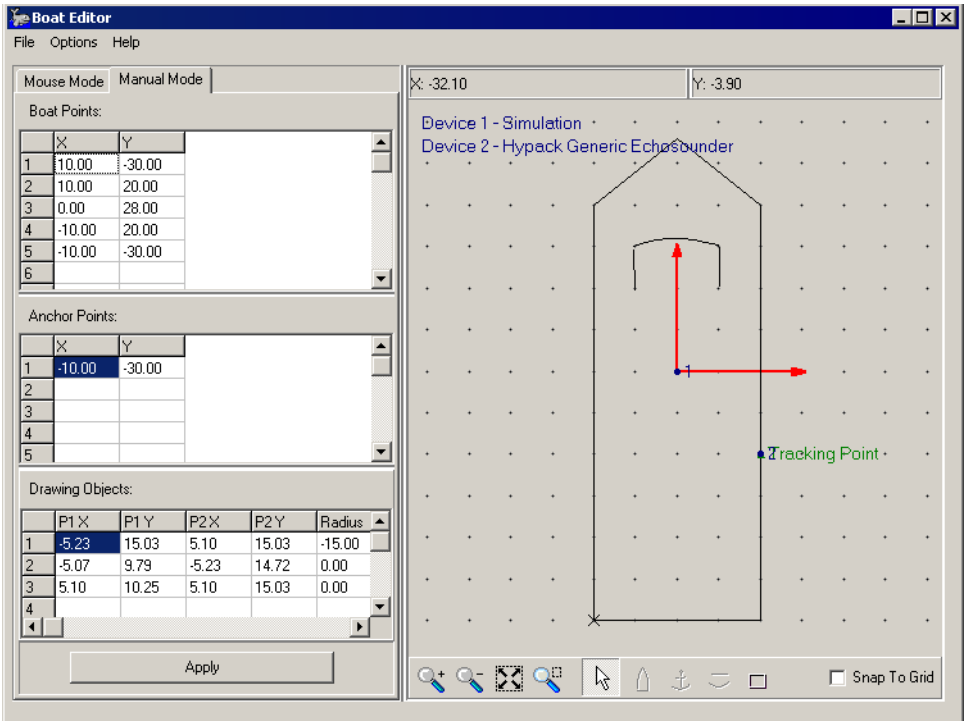
CREATING A BOAT SHAPE

In the BOAT SHAPE EDITOR, you will draw your boat shape in the design area.

- In **Manual Mode**, type the offset coordinates in the spreadsheets provided: Boat Points, Anchor Points and Drawing Objects.
- In **Mouse Mode**, use the drawing tools and click in the design area to define the boat shape perimeter and features.

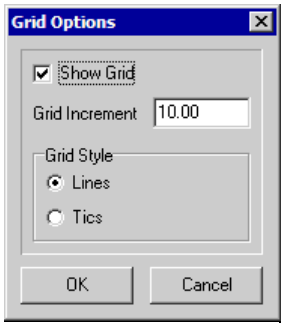
  The 'Snap to Grid' feature shifts each point to the nearest grid intersection.

FIGURE 8-1. *A Sample Boat Shape in the Editor.*



1. **Establish an origin point on your survey boat**. This will be the same origin from which you offset your devices in the HARDWARE programs. A solid circle represents the origin in the design area.
2. **Open the BOAT SHAPE EDITOR** by clicking PREPARATION-EDITORS-BOAT SHAPE EDITOR.
3. **Click on FILE-NEW SHAPE** to indicate that you are creating a new boat shape (or FILE-OPEN SHAPE to load a boat shape that you want to modify).
4. **Set your display options.**
   - **Check which items you want to see drawn** in the BOAT SHAPE EDITOR.
     - **Show Devices** shows a list of hardware devices in the upper left corner of the drawing area.
     - **Show Offsets** draws devices and tracking point in position on the boat shape according to the listing in the Survey32.ini.
     - **Show Anchor Points** draws an "X" at each anchor point.
     - **Show Drawing Objects** draws the lines described in the Drawing Objects spreadsheet.
   - **Set your grid options. (Optional)** Using a grid is not required, but it is much easier to create a vessel with the correct dimensions.

FIGURE 8-2. *BOAT SHAPE EDITOR Grid Options*



     - **Show Grid** implements the grid display in the design window. If you check 'Snap to Grid' in the editor tool bar, all points that you define with your cursor while drawing your boat shape will automatically shift to the nearest grid line.
     - **Grid Increment** sets the distance represented by each grid line.
     - **Grid Style** determines whether the grid is drawn with lines or only marks where line intersections would occur.
5. **Describe your boat shape.**
   - **In Manual Mode:** In the Boat Shape spreadsheet, enter the coordinates defining the perimeter of the boat shape relative to the boat origin.

- **In Mouse Mode:** Click the boat tool and, using the origin and the grid to guide you, click around the outline of your vessel. The horizontal offset coordinates of those points (in survey units) relative to the origin appear in the Boat Points list on the left. The program will automatically close your boat shape back to the first point in the list.

FIGURE 8-3. *Drawing Tools—(left to right) Boat, Anchor and Drawing Objects*

6. **Enter your anchor points**. (Optional)
   - **In Manual Mode:** In the Anchor Points spreadsheet, enter the coordinates defining offset the coordinates relative to the boat origin for each anchor.
   - **In Mouse Mode:** Click the anchor tool then click on the boat shape at the anchor locations. The horizontal offset coordinates of those points, relative to your vessel origin, appear in the Anchor Points list on the left. You can enter up to nine anchor locations for your boat.

MODIFYING AN EXISTING BOAT SHAPE

It's simple to modify your boat shape in the BOAT SHAPE EDITOR. At any time, you can do any of the following:

- Edit any of the coordinates that describe the vessel outline, anchors or drawing objects.
- Change the location of the vessel origin.
- Rescale the vessel to a different size.

MODIFYING OBJECT COORDINATES IN YOUR BOAT SHAPE

You may need to change one or more coordinate pairs in your boat shape for any of the following reasons:

- to change the vessel outline
- to relocate an anchor
- to change the size, shape or location of a drawing object

There are two methods to relocate select coordinates that describe your vessel.

To relocate coordinates using your cursor:

1. **Click the tool appropriate for the object you want to change**
2. **In the design area, drag the object to a its new location.** The coordinates will update accordingly.

3. **Save your boat shape file.** Select FILE-SAVE SHAPE and name your shape in the dialog provided.

To relocate coordinates in the spreadsheet:

1. **Select the coordinates in the object list.**
2. **Edit them in the spreadsheet at the lower left**. The drawing in the design area will update accordingly.
3. **Save your boat shape file.** Select FILE-SAVE SHAPE and name your shape in the dialog provided.

To add a point in your boat shape outline:

1. **Select the boat tool.**
2. **Right-click on the coordinate pair preceding where you need the new point and select 'Insert'**. A point will be added mid-way between the selected point and the next existing coordinate pair.

The selected point is displayed in blue in the design area. You can determine which side of a selected point the new one will be drawn by clicking two consecutive points and observing where they are located relative to each other.

3. **Edit the coordinates to position the new point** as required for your boat shape.
4. **Save your boat shape file.** Select FILE-SAVE SHAPE and name your shape in the dialog provided.

Relocating the Vessel Origin in your Boat Shape

If you have an existing boat shape file, but the origin on which it is based, is not the origin of your hardware configuration, you could draw a new boat shape file, but there's an easier solution. You can redefine the position of the origin in your shape file and the BOAT SHAPE EDITOR updates all the offset coordinates accordingly.

NOTE This *does not* affect your hardware configuration.

1. **Select OPTIONS-SET ORIGIN POINT**. The cursor, held over the drawing area, appears as two concentric circles.
2. **In the drawing area, click at the new origin position.** The origin marker will move to the click position and all coordinates listed on the left will update accordingly.
3. **Save your boat shape file.** Select FILE-SAVE SHAPE and name your shape in the dialog provided.

Scaling your Boat Shape in the Boat Shape Editor

You can uniformly increase or decrease the size of your boat shape by multiplying all offsets and radii by the same number. You could do this by manually editing each set of coordinates and radii individually, but there's a much easier way.

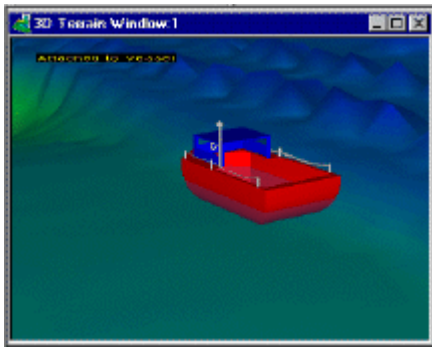
1. **Select OPTIONS-SCALE BOAT SHAPE**.
2. **Enter a value by which the coordinates should be multiplied**. For example, to double the size of the boat shape, enter 2.
3. **Click [OK]**. The coordinates and radii will be multiplied and the drawing in the design area will update accordingly.

Save your boat shape file. Select FILE-SAVE SHAPE and name your shape in the dialog provided.

3D SHAPE EDITOR

The 3D SHAPE EDITOR is used to create custom, 3-dimensional shapes. These shapes are saved to 3OD files that can then be imported to the 3D TERRAIN VIEWER (3DTV or MATRIX 3DTV) in order to provide the most realistic display possible.

FIGURE 8-1. *A 3D Vessel Shape displayed in the 3D Terrain Viewer*



The 3D SHAPE EDITOR can be used to create near replicas of your vessel. You can then import them to the 3D TERRAIN VIEWER programs and navigate on the virtual water there as you steer your vessel during your survey or dredging. Dredges constructed using 3D SHAPE EDITOR's dredge templates can be fully animated showing your digging tool at work.

You can also create objects other than vessels which can be imported to 3DTV to enhance your display.

- The pole template provides a ready-made shape depicting a typical telephone or electric pole. A series of these in 3DTV will automatically be connected with a user-defined number of wires.
- Custom buoy shapes can be created to float on the water surface in the correct horizontal position.
- Stationary objects such as buildings and fences can be created to display on the land surrounding your survey area.

3D SHAPE EDITOR INTERFACE

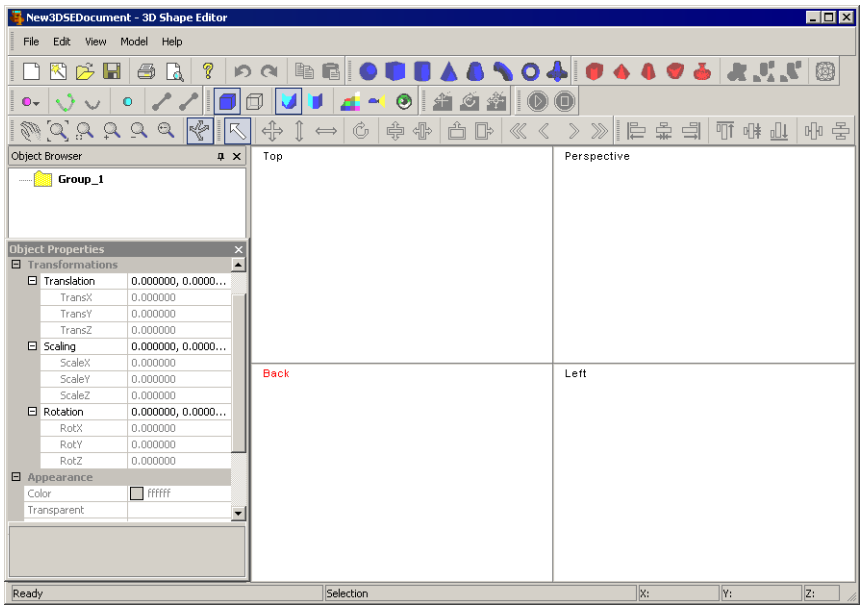
Launch the 3D SHAPE EDITOR by selecting PREPARATION-EDITORS-3D SHAPE EDITOR.

FIGURE 8-2. *3D SHAPE EDITOR Interface*

Toolbars

Object Browser

Object Properties



4 Drawings:
Perspective
Top/Bottom
Front/Back
Left/Right

The 3D SHAPE EDITOR has a series of toolbars that are used to create and manipulate various 3-dimensional shapes, which can be put together to model your custom shape. Hold your cursor over any icon to view the icon name.

You may reposition and size all windows by using the cursor to drag the title bars and window edges. You can arrange the windows in one or more monitors. Once you have sized and placed the windows on the screen, the program will remember and restore them to the same status and location each time you start the program.

OBJECT BROWSER IN 3D SHAPE EDITOR

The **Object Browser** shows a tree view listing of each object as it is created.

In addition to the usual resizing and repositioning, you can ‘hide’ it along the side to which it is docked. When it is hidden, only a tab appears along the margin of the editor and temporarily bring them into view when you need them by clicking on the tab. When you move your focus off the window, it slides back into hiding.

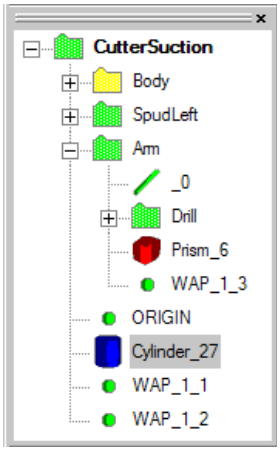
To hide and restore the window, click on the thumbtack in the upper right corner of the window.

Simple objects (an individual object as it is created from the menu bars) can be listed under the root of the tree view, or grouped together into subgroups which appear as nodes on the tree view.

Grouped objects create complex objects which can then be selected and translated or rotated as a unit within the design while maintaining each

component object's size, orientation and position relative to the others in the group.

FIGURE 8-3. *Sample Object Browser*



OBJECT PROPERTIES IN 3D SHAPE EDITOR

The **Object Properties** lists various attributes of a selected object as it is drawn in the design windows. Through the Object Properties, you can view and modify

- name
- orientation (rotation)
- color
- transparency
- size (scale)
- position (translation)
- texture
- visibility

Basic Objects have additional properties that are specific to the object type. These include:

- Edge measurement
- Radius
- Height

These properties, with the object's scale properties, determine the final object size. The effects of any modifications will be updated and displayed in the drawings.

In addition to the usual resizing and repositioning, you can 'hide' it along the side to which it is docked. When it is hidden, only a tab appears along the margin of the editor and temporarily bring them into view when you need them by clicking on the tab. When you move your focus off the window, it slides back into hiding.

To hide and restore the window, click on the thumbtack in the upper right corner of the window.

Design Window in 3D Shape Editor

The 4-paned design window enables you to view and manipulate your design from all angles. Right click and select "Change View" to toggle the 2-dimensional design windows (top, front or right side views) to show the opposite face (bottom, back or left side views respectively).

The System Default **background color** is read from your Windows® settings, but you can:

- **Choose a black or white background** by selecting VIEW-BACKGROUND COLOR- and either BLACK or WHITE.
- **Set another color** by selecting VIEW-BACKGROUND COLOR-USER DEFINED, then VIEW-BACKGROUND COLOR-EDIT and choosing your color through the color dialog.

If a color other than that chosen in Windows® is active when you select FILE-SET DEFAULTS, that color will be used each time you launch the 3D SHAPE EDITOR or begin a new shape.

To guide your drawing, you can toggle a display of rulers and grid tics through the VIEW ORTHO TOOLS menu.

The upper right pane is a 3-dimensional perspective view of your design which may be viewed from any angle using the "Move 3D Camera" tool.

The **Status bar** shows the current cursor position or object rotation, translation or scaling, depending on which tool is active.

Active Tool	Display
Select Tool	Current Cursor position relative to the origin of the complex shape (X, Y, Z)
Rotation Tool	Rotation of currently selected object where 0 is upward and values increase in a clockwise direction. (RotX, RotY, RotZ)
Horizontal or Vertical Translation	Translation of current object relative to the origin of the complex shape (TransX, TransY, TransZ)
Horizontal or Vertical Scaling	Scale of current object (ScaleX, ScaleY, ScaleZ).

Adjusting the View in 3D Shape Editor

The 3D SHAPE EDITOR provides several options to optimize your view of your custom shape in the design panes. You can change the:

- **Model** itself by changing the model type, color and shading.

- **Camera Position** (viewing distance and angle)
- **Lighting** to optimize your view

Once you have chosen these settings, as well as others controlled through the menus and icons, you can set them as your default settings by selecting FILE-SET DEFAULT. These settings will be implemented for each new custom shape.

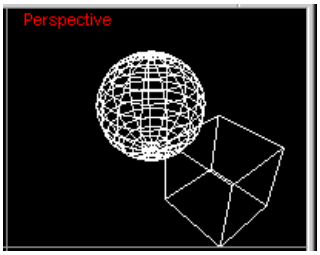
Model Type in the 3D Shape Editor

The Model menu provides a few display options which are also accessible through the Model tool bar.

Solid draws an opaque, custom shape in the colors chosen for the component objects in their object properties.

Wire Frame draws your custom shape as a white transparent line drawing. The selected wire-frame objects are displayed in color.

FIGURE 8-4. *Wire Frame Model*



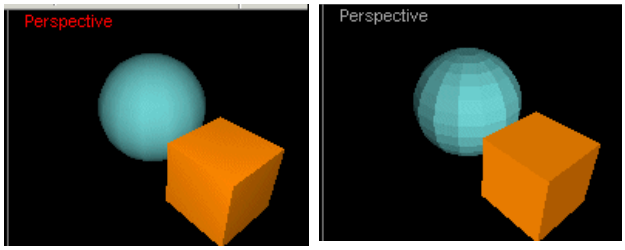
Lighting and Shading in the 3D Shape Editor

The **Mining Lamp** sets the position of the light source to match the camera position. Initially, it will follow the camera's XYZ position.

If you turn the mining lamp off, the light will remain on the most recently illuminated side of the shape, regardless of its orientation in the design panes.

Sharp Shading uses the same shade intensity on the whole face, It shows the edges where faces are joined. **Smooth Shading** varies intensity of shade across the face in a more realistic manner. It smooths rounded shapes.

FIGURE 8-5. *Solid shading - Smooth (left), Sharp (right)*



OBJECT COLOR IN THE 3D SHAPE EDITOR

The **Default Color** will be used when each new object is created. It can be changed through the standard Color dialog which is opened by selecting MODEL-DEFAULT COLOR.

You can change the object color after it is created by changing its Color property.

CAMERA POSITIONING IN THE 3D SHAPE EDITOR

As you build your custom shape, you will often find it necessary to adjust what you see in the design panes in order to work on your model effectively.

In the 2-dimensional design panes:

- The **Camera tool bar** provides the customary Zoom and Pan functions, which allow you to adjust the view in the 2-dimensional design panes to optimize the display for your use.

FIGURE 8-6. *Camera Toolbar*

- The **right-click menu** for each design pane contains two options that can affect the display.

FIGURE 8-7. *3D Shape Editor Right-click Menu*

- **Change View** allows you to see the opposite face of the custom shape. The label of the design pane will update with each change.
- **Maximize Screen** expands the pane to full screen view. It will be restored to its smaller size by deselecting this option.

In the 3-dimensional design pane:

- **Zoom in and out** on this view by:
  - Holding the right mouse button down and moving the cursor up and down.
  - Holding Shift and using the up and down arrow keys.
  - Holding Shift + Ctrl and using the up and down arrow keys for faster motion.
- The **3D Camera Control** is used to change the camera angle to view the custom shape from any angle. This gives the effect of rotating, pitching and rolling the custom shape display around the center point of the shape.
  - The **Up and Down Arrow** keys rotate camera vertically around the center point. Add the Control key to increase the amount of change for each click.
  - The **Left and Right Arrow** keys rotate horizontally around the center point. Add the Control key to increase the amount of change for each click.

RUNNING THE 3D SHAPE EDITOR

The 3D SHAPE EDITOR is a little challenging to use but, with practice, you can create detailed images that can greatly enhance your display.

Before we begin, it will be helpful to note the distinction between objects and shapes in the 3D SHAPE EDITOR.

Objects are 3D forms which are positioned and grouped together to build your **custom shape**. A variety of predefined forms are available as "basic" objects. Additional "advanced" objects are formed from user input which provides considerable flexibility in creating objects that you need to build your custom shape.

A *very* over-simplified sequence to create a custom shape might be as follows:

1. **Open a 3OD file.** This file contains all of the information about your custom shape. You can either create a new one or open an existing file to modify.
2. **Set your default dimensions for each object to be created.** You can set them to 1x1x1 or 2x2x2 survey units through the MODEL-DEFAULT DIMENSIONS menu.
3. **Select an object from one of the tool bars and place it in the design window**.
4. **Set the object properties.** Properties include:
   - Scale
   - Position
   - Rotation
   - Color
   - Texture
   - Transparency
   - Visibility
   - Other object-specific properties
5. **Repeat steps 3 and 4** using various objects with which to "build" a custom shape that matches your real-world shape. grouping the objects where appropriate.
6. **Save your custom shape** by **s**electing FILE-SAVE (or FILE-SAVE AS) and naming your file. It will be saved, by default, to your Hypack\Shapes directory with a 3OD extension.

NOTE: If you make a change that turns out not to be what you had in mind, click the "Undo" button to reverse the action. The "Redo" button reverses the "Undo".

Opening Custom Shape Files in the 3D Shape Editor

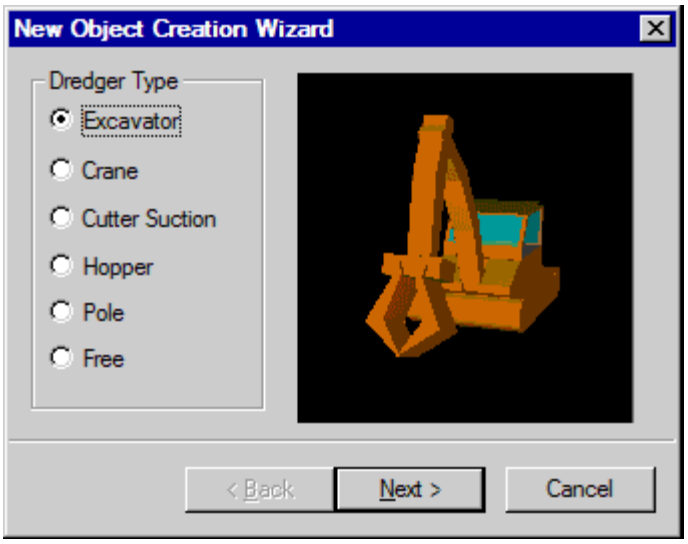
Whether you are using the 3D SHAPE EDITOR to build a new custom shape or to modify an existing one, the first step is to open the 3D shape file (*.3OD).

Creating a New Shape in 3D Shape Editor

In the 3D SHAPE EDITOR, you may construct a custom shape manually, or you may select a predefined shape through the wizard.

- **To create a new shape manually,** select FILE-NEW. The 3D SHAPE EDITOR interface will provide a blank display, ready for you to set your default dimensions and begin building your own custom shape.
- **To select a predefined custom shape**, select FILE-NEW BY WIZARD. A dialog will appear providing a choice of shape templates.

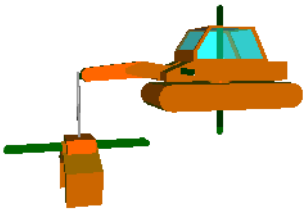
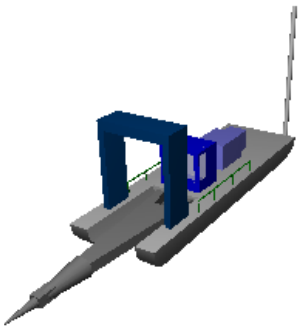
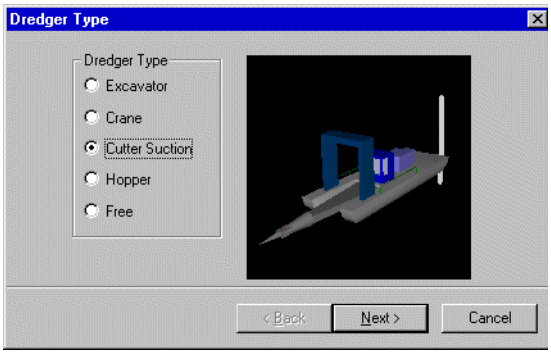
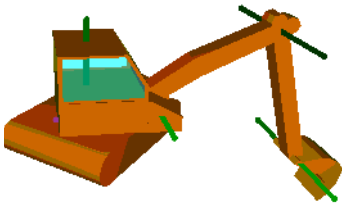
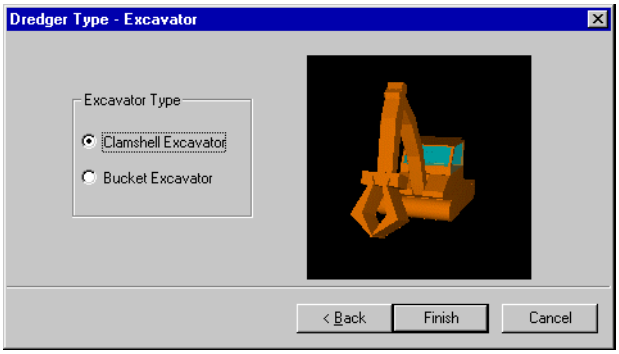
FIGURE 8-8. *New Shape Wizard*

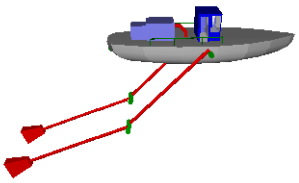
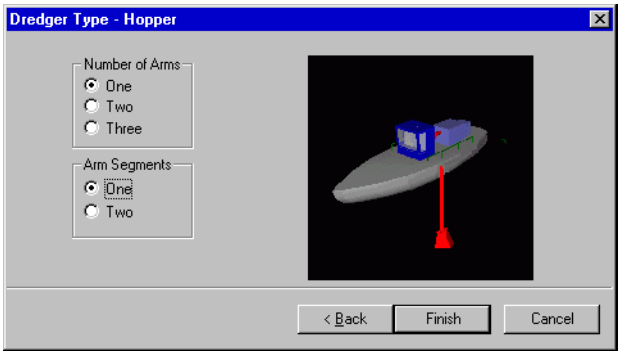
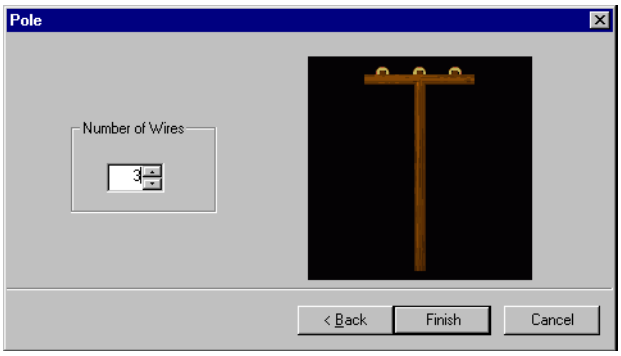


A shape **template** is a predefined 3D shape file with certain unalterable features including object groups, the number, orientation and names of axes that create joints on mobile dredge parts, and the number and names of wire-attach points. You may modify other object parts, although they have a default shape, to more closely resemble your vessel.

If you are creating a dredge with moving parts, you must select the template most closely resembling your vessel. Excavator, cutter suction and hopper dredges have additional selections to further describe them.

TABLE 8-1. *Dredge Templates*

Crane		Cranes have no additional settings.
Cutter Suction Dredge		
Excavator		

Hopper Dredge		
Pole		

If you want to create power lines, select 'Pole' and the number of wires they support. When deployed in 3D TERRAIN VIEWER, wires automatically link the like-numbered attachment points with wires.

If you are creating a shape other than a dredge or power lines, you should choose the "Free" option and build it yourself.

Importing Third Party Shape Files to 3D Shape Editor

3D SHAPE EDITOR can import files from a selection of file formats of other types than its current 3OD files. Now we can import the following formats:

- **VES** files are a shape format created by early versions of the 3D SHAPE EDITOR. Users who may have created such custom shapes can now be imported and converted to 3OD format.
- **CHN** files were used in the original 3D SHAPE EDITOR. Though HYPACK® provided no utility with which to create shapes beyond the generic Boat.CHN included in HYPACK®, some creative users located freeware tools with which to create them. They can now be imported and converted to 3OD files.
- **3DS** files are another file format that can be created in third party programs, imported to 3D SHAPE EDITOR and converted to 3OD format. The 3D SHAPE EDITOR imports only geometry, color and texture of the objects defined in 3DS files. The texture file must be in

the same folder as the 3DS file, and it must be a BMP file that conforms to certain specifications.

- **MD2** is a mesh based 3D object format, widely accepted among the 3D designers and modelers. It is used in Quake for object representation.
- **WRL** files created in VRML97 (ISO/IEC 14772-1:1997) compliant packages. Nodes related to interaction with user, extern links, scene presentation (background, views, lights), sound and animation are ignored.

All shapes imported from these formats will appear as a single 'mesh' object in the 3D SHAPE EDITOR, and can be modified by adding objects.

To import these files, select FILE-IMPORT and the option for the file type you wish to import.

More Information

- "Setting Object Textures" on page 8-67

Loading Existing Custom Shapes in the 3D SHAPE EDITOR

If you want to modify a 3D shape, you begin by loading the 3D shape file into the 3D SHAPE EDITOR.

1. **Select FILE-OPEN**. The File Select dialog defaults to the location to or from which you last exported or imported 3OD file.
2. **Select the required 3OD file** and the 3D shape will be displayed.

Animating Dredge Template Files in the 3D Shape Editor

Dredges and digging tools created from the dredge templates can be animated in the 3D SHAPE EDITOR to preview the type of motion you might expect during DREDGEPACK®.

Use the Animation tool bar to start and stop the preprogrammed motion. The dredge shape will repeat the animation loop, which depicts typical motion for the type of dredge you have chosen, until you click the stop button. While it is in motion, you can zoom, pan and rotate the model to inspect it from any angle you desire or modify any of the object properties.

NOTE: Animation is not available when VIEW–WHOLE MODEL is selected.

CREATING OBJECTS IN THE 3D SHAPE EDITOR

Objects are the component parts used to build a complex custom shape. Several common shapes are pre-programmed into the editor interface to help create close facsimiles of survey vessels, dredges, buoys, buildings, power lines, etc.

When each object is initially placed in the design window:

- It is assigned a unique name according to the object type and order of creation (ex.Cube_1).
- It is created according to the default dimensions, which can be set to 1x1x1 or 2x2x2 survey units through the MODEL-DEFAULT DIMENSIONS menu. If your default dimensions are 1x1x1 and no other properties (such as height or radius) are set to affect the object dimensions, you can enter the object's real-world measurements in the X, Y, and Z Scale properties to obtain an object with the correct dimensions for your purpose.

CREATING BASIC OBJECTS IN THE 3D SHAPE EDITOR

The Basic Objects tool bar provides a choice of basic 3-dimensional shapes that can be used as components of your custom shape.

FIGURE 8-9. *Basic Objects Toolbar*

Just click the icon corresponding to the shape you need, then click in any of the 2-dimensional design panes to place the object in its approximate position. You will set exact positioning, as well as other properties, in the properties toolbar.

CREATING ADVANCED OBJECTS IN THE 3D SHAPE EDITOR

The Advanced Objects toolbar enables you to create more complex shapes that might be useful in creating your custom shape. The first set will each access the Object Modeling Window where you draw the footprint of the desired shape and set any applicable additional settings. When that is completed, the finished shape is created according to the icon selected and "floats" at the end of your cursor ready to be positioned in any of the 2-dimensional views.

FIGURE 8-10. *Advanced Objects Toolbar*

The **Prism** top and bottom faces match the user-defined footprint. Side faces are drawn by connecting corresponding vertices on the base and the top.

The **Pyramid** creates an edge of the pyramid between each point that defines the footprint and a point that is above the base. When you select a pyramid shape, the Object Modeling window includes sloped option which allows you to offset the base from the position of the apex, which will then remain above the coordinated system center.

The **Truncated Pyramid** forms a face parallel to the base that is a smaller scale version of the footprint. The side faces are drawn by connecting corresponding points on the base and the top. When you select a truncated pyramid shape, the Object Modeling window includes ratio and sloped options.

The **Hull** uses the user-defined footprint as the base. A scale version of the footprint forms a parallel top face. Side faces are drawn by connecting corresponding points on the base and the top. The outer edges, however, are bowed rather than straight in an attempt to approximate the shape of a boat hull. When you select a hull shape, the Object Modeling window includes the sloped, ratio and slices options with which you can control the object shape.

The **Revolution** object uses a user-defined object profile, which is then repeated around the Y axis to complete the object form. When this object is selected, the Object Modeling window will only allow you to draw a right profile as the shape is symmetrical around the Y axis.

Additional Settings may include:

- The "**Sloped**" checkbox creates a prism, pyramid, truncated pyramid, or hull in which the upper face (or pyramid apex) is offset from the lower face. The offset is determined by the distance off center that you draw the footprint on the drawing board.
- **Smooth** softens the appearance of lateral edges in prisms and pyramids.
- **Ratio** defines the proportion of the upper face compared to the lower face. The value must be in the range from 0.01 to 10 inclusive.

Ratio Value	Result
< 1	a top face smaller than the bottom. The hull sides are concave.
= 1	a prism
> 1	a top face larger than the bottom. The hull sides are convex.

- **Slices** determines the number of segments in the line that connects the upper to lower face. The value must be in the following ranges:

Object	Allowable Values	Result
Hull	1-20	A value of 1 results in straight lines joining each corresponding point on the upper and lower faces (a truncated pyramid) and 20 creates a smoothly curved surface. This is most clearly visible in the top or bottom view.
Revolution Object	3-30	This value sets the number of sides in a horizontal cross section of the object. 30 makes a smoothly round cross section.

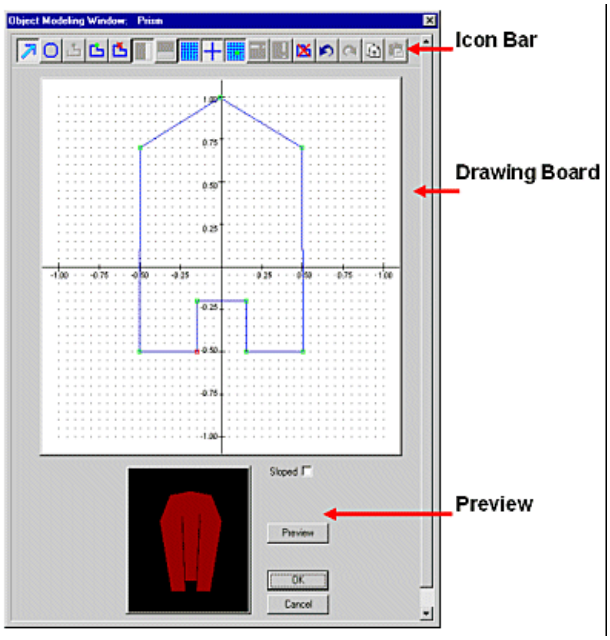
NOTE: An increased number of slices results in a better presentation quality, but may slow the refresh rate in 3DTV.

The Wire and Wire Attachment Point icons are used to create wire and cable objects.

OBJECT MODELING WINDOW

When you select any of the advanced object icons, the Object Modeling Window will automatically appear.

FIGURE 8-11. Object Modeling Window



The white area is your drawing board. In its simplest presentation, it is only bisected, both vertically and horizontally by a plain line. You can add further drawing guides by selecting various icons from the tool bar as follows:

Icon Name	Icon	Added Drawing Guide
Axis Marks		Tics at each quarter distance along each axis.
Grid		Dots marking a grid at intervals of 0.05 units.
Snap to Grid		Assists in keeping sides straight and aligned with the drawing board grid.
Vertical Ruler		Draws a straight vertical line from first point (an end point) defined by cursor to the levels of each subsequent position. A dotted line creates a crosshair effect to that assists in precise point positioning.
Horizontal Ruler		Draws a straight horizontal line from first point (an end point) defined by cursor to the levels of each subsequent position. A dotted line creates a crosshair effect to that assists in precise point positioning.

Icon Name	Icon	Added Drawing Guide
Vertically Symmetric		Automatically mirrors a user-defined shape drawn above the horizontal axis in the area below.
Horizontally Symmetric		Automatically mirrors a user-defined shape drawn left the vertical axis in the area on the right.
Undo		Reverses the last operation.
Redo		Reverses the last "Undo" command.

The length of each axis depends on the default set through the MODEL-DEFAULT DIMENSIONS menu option.

- When 2x2x2 is selected, the length is one unit in each direction from the center 0,0 point.
- When 1x1x1 is selected the length is 0.5 in each direction.

You can further adjust the scale of your component pieces in the object properties.

The scale of your custom shape can be adjusted in the 3D TERRAIN VIEWER in the Vessel Settings dialog.

A small preview of your object is shown below the drawing board. If it doesn't look right to you, go back to the drawing board!

Drawing Advanced Object Faces in the Object Modeling Window

When the Object Modeling Window appears, the cursor defaults to the drawing pencil cursor (the Add Point icon is selected).

1. **Select the drawing board features** that are helpful to you.
2. **Use the cursor to draw the footprint of your custom shape**.
   - Fine tune the positioning of each point using the arrow keys as you draw them.
   - Remove the last point using the delete key
   - The OBJECT MODELING WINDOW will automatically close the polygon when you:
     - deselect the Add Point icon
     - hit the Enter key
     - click on the first point.
   - **To draw regular shapes**, click the Equilateral Polygon Icon and enter the desired number of sides. The defined shape will be drawn.
3. **Set slope, ratio and slices options** where applicable to the chosen object.
4. **Preview the described shape** in the lower area of the window. If the shape is not as you had planned, you can "go back to the drawing

board" (literally) and either modify what you have created or erase it and start over.

5. **Modify your shape**, if necessary, using the editing tools.
6. **When you are satisfied with your shape, click [OK].** The dialog will close and your shape will be ready at the end of your cursor to be placed in your custom shape design.
7. **Place the object in its approximate position** by clicking in any of the 2-dimensional design panes. You will set exact positioning in the properties toolbar.

More Information

- "Editing Advanced Objects" on page 8-50
- "Positioning Objects into your Custom Shape" on page 8-59

Editing Advanced Objects

Once you have a closed polygon on your drawing board. There are several ways that you can modify the size and shape.

To move the shape on the drawing board:

1. **Click the Select icon**.
2. **Click inside the shape and drag it to the new position**.

To move a point:

1. **Click the Select icon**.
2. **Use the cursor to drag existing points in your polygon to new positions**.

To insert a point:

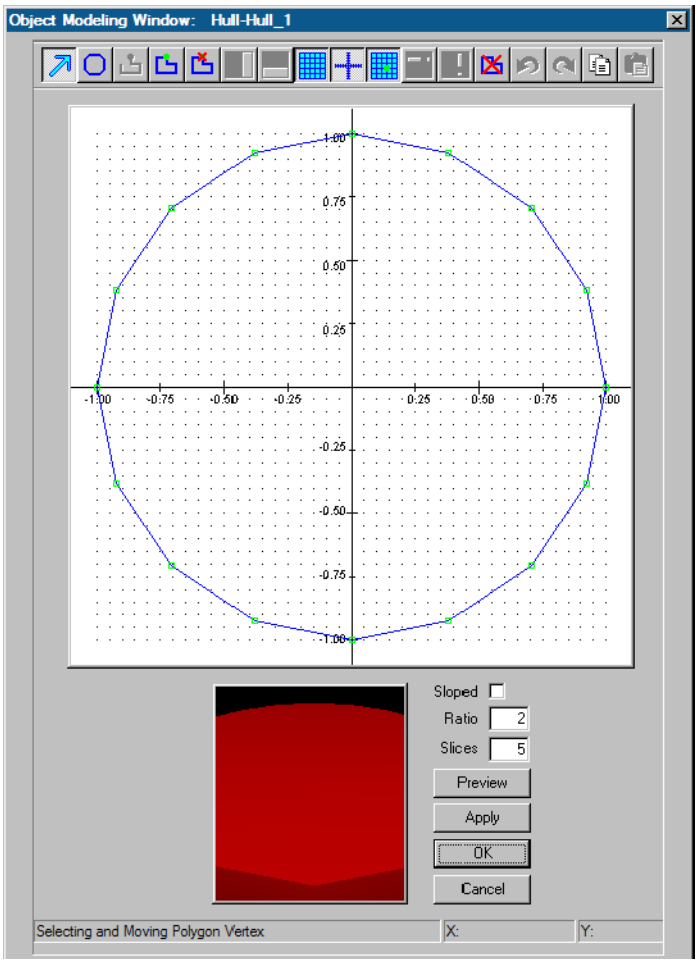
1. **Click the Insert Point icon**. (The cursor will return to the pencil.)
2. **Use the cursor to click where, on the polygon edge, you need an additional defining point.** If you click elsewhere in the drawing board, the Object Modeling window will include the added point to the nearest polygon segment and adjust the shape accordingly.

To delete a point:

1. **Click the Delete Point icon** (the cursor will change to an eraser).
2. **Click the point that you want to remove** from your footprint shape.

The Object Modeling Windowalso includes some additional tools that may help you achieve the results you need. The Copy and Paste icons may be helpful particularly if you are working with complex shapes.

FIGURE 8-12. *Object Modeling Window*



The **Copy and Paste functions** work together. The Copy icon stores the polygon as it appears in the drawing board to a temporary memory. You can restore the drawing board with the most recently copied shape using the Paste icon.

Using this pair of features, you can modify a footprint incrementally, saving each change or set of changes as you progress by clicking the Copy icon. At any time during the modification process, you can return to the most recently copied shape with the Paste icon.

The copied shape is stored even after leaving the Object Modeling window. This enables you to create multiple advanced objects with identical footprints by copying the first footprint, then pasting it into the drawing board for the subsequent advanced objects.

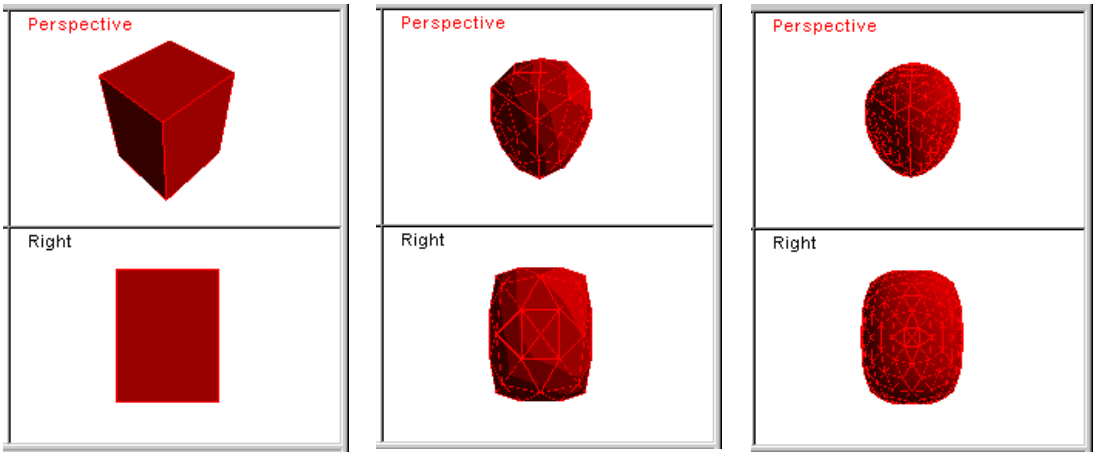
To erase the polygon, from the drawing board, click the Delete Polygon icon.

NOTE: You can also use the Object Modeling window to modify advanced shapes after they are placed in your design window. Right click on

the object in the Object Browser or in one of the design panes and select "Edit/Activate Face" (or double click the object)

Once you have placed an advanced object in the design window, you may use the smoothing tool to round the edges and planes in your shape. You may smooth the same object multiple times, however the resulting shape may not have more than 50,000 faces.

FIGURE 8-13. *Smoothing an Object - Original Object (left), Smoothed Once (center), Smoothed Twice (right)*



CREATING VESSEL ORIGIN AND ATTACHMENT POINTS

The **vessel origin,** as you probably know by now, is the key to accurately positioning *everything* in SURVEY! When you create a custom shape to represent your vessel, the vessel origin is required for HYPACK® to accurately position the vessel. Position the origin in your 3D vessel in the same position as in your hardware setup.

NOTE: To assist you in selecting small points, you can select EDIT-SELECTION SPOT RADIUS-BIG. This increases the area where you can select an object, but it will decrease accuracy.

On a dredge, the **attachment points** for dredge arms and spuds should also be included; do not include the spuds and arms themselves. (You can attach up to three items.)

When your vessel is imported into the 3D TERRAIN VIEWER:

- **Dredge arms** are represented by a single cylinder between the attachment point and the digging tool.
- **Spuds** are represented by a vertical cylinder:
  - At the attachment point, or
  - Connected with attachment point by horizontal cylinder if the spud is placed on motorized carrier.

The cylinders' diameter and color, as well as cylinder length for vertical bar should be set in 3DTV.

Replicating Objects in your Custom Shape

You can quickly and easily create multiple objects of the same size, shape and color using the "copy" and "paste" method. This option can be handy in creating items, such as railings or ladders that have several identical pieces.

1. **Create the first object** as described in the previous sections.
2. **Copy the object**. There are two methods to do this, each with the same results:
   - Select the object then select EDIT-COPY (Ctrl + C).
   - Right click the object, in the Object Browser or in a 2D design window, and select Copy from the pop-up menu.
3. **Paste the object into your custom shape**. There are two methods to do this, *each with different results*.
   - Select EDIT-PASTE (or Ctrl + V) and a duplicate object will appear at the origin of the active group.
   - Right click at the location in your custom shape where you want the duplicate object to be positioned and select Paste from the pop-up menu. The duplicate object will be centered on your cursor position.

Connecting Objects and Shapes

3D Shape Editor provides a selection of methods to create connecting parts. Select the object type according to the required properties.

- A **wire** may have multiple attachment points along its length, it can be attached to any type of object and have an extension factor which allows the wire to be tight or slack between attachment points.
- An **Extensible Object** is a cylindrical object whose ends are each attached to independently moving objects in the shape. It expands and contracts as the mobiles move to maintain contact at each attachment point.
- A **Connector** is similar to an extensible object in that it connects two moving parts and its length adjusts according to the distance between the shapes. A connector joins *separate 3OD files*, while extensible objects join moving object groups within the same 3OD file.

Wire and Cable Objects in the 3D Shape Editor

The 3D SHAPE EDITOR supports wire objects that are initially defined by their attachment point locations. Wire objects are further described by

radii and extension factor properties that are applied to the connecting wire.

Automatic Wire Connections:

The **pole template** provides a ready-made shape depicting a typical telephone or electric pole. Notice that the template is, *complete with a user-defined number of wire attachment points*; you should not manually add any more. A series of these poles in 3DTV will automatically be connected with wires.

Manual Wire Connections:

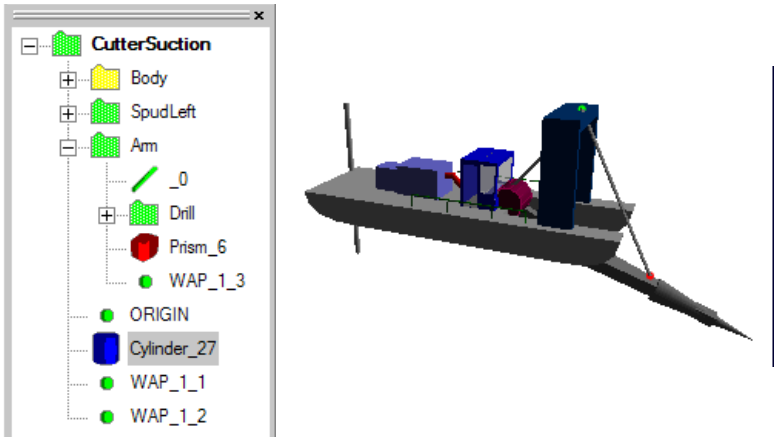
You can create other shapes that include wire objects by manually creating the wire attachment points. The attachment points are created in the order that the wire will connect them.

NOTE: A large number of wires may slow the refresh rate in 3DTV, so we recommend using them *sparingly*.

This feature is intended to create wires to connect moving parts of the dredge template shapes which will move and adjust length with the motion of the dredge. It is important to place the attachment points in the appropriate group within the dredge template shape.

In the following figure, the first attachment point (WAP1_1) is at the cable spool in front of the cabin, the second (WAP1_2) on top of the A-frame and the third (WAP1_3) on the ladder and in the 'Arm' group. If a second wire were created, the attachment points would be named WAP2_1, WAP2_2, etc.

FIGURE 8-14. *Wires accommodate the motion of the cutter head*



Joining Objects with Wires:

To join objects with wires:

1. **Create all of the solid objects**.
2. **Click the Wire icon** to begin the wire object.
3. **Define each attachment point**, *in order*, for that wire object.
4. **Click the Wire Attachment Points icon**.

5. **Click the position in your custom shape in one of the design windows**. The wire attachment points are named 'WAP' followed by two numbers representing the wire number and its order in the wire. For example, WAP_1_2 is the second attachment point of the first wire.
6. **Click the Wire icon again** to end the object.
7. **Position the attachment point accurately** using the translation tools and properties. Depending on which design window you used to initially set your point, you will probably need to adjust its position along the other axes to perfect its position within the context of your custom shape.

More Information

- "Setting Object Physical Attributes" on page 8-62

Extensible Objects in the 3D Shape Editor

Extensible objects join two objects, at least one of which moves. The extensible object expands and contracts as the distance between the objects varies.

To create extensible objects:

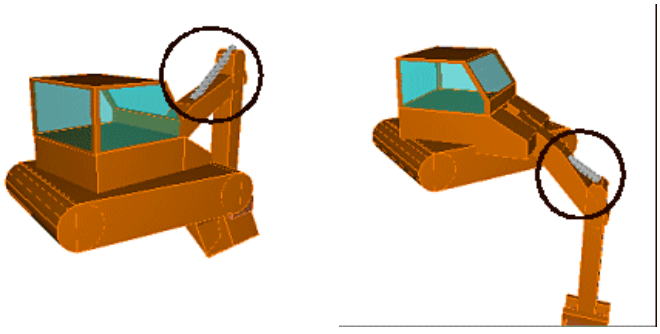
1. **Click the Extensible Part Start icon and place the object** at the attachment point on one of the objects in your shape.

FIGURE 8-15. *Extensible Part Start and End Icons*

2. **Click the Extensible Part End icon and place the object** at the other attachment point on a different mobile group in the shape.

   Each extensible object will be created with the default radius and color.

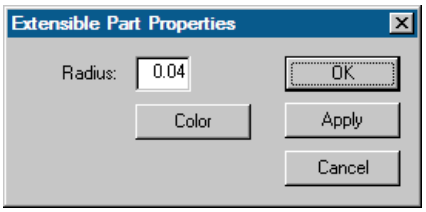
FIGURE 8-16. *An Extensible object expands and contracts as the distance between the attachment points change.*



To modify the radius and color of extensible objects:

1. **Double-click on the object or attachment point.** The Extensible Part Properties dialog will appear.

FIGURE 8-17. *Extensible Parts Properties*

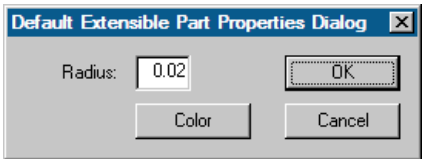


2. **Set the radius and color** of your extensible object and click [OK].

To modify the default extensible object settings:

1. **Select MODEL-EXTENSIBLE PART PROPERTIES**. The Extensible Part Default Properties dialog will appear**.**
2. **Set the radius and color and click [OK].**

FIGURE 8-18. *Extensible Part Default Properties dialog*



CONNECTORS IN 3D SHAPE EDITOR

Connectors are similar to the extensible objects, except each end resides on separate 3OD files. They appear only as a type of attachment point in 3D SHAPE EDITOR. However, in 3DTV, like-named connection points will be joined by a cylinder of user-defined radius, whose length will automatically adjust according to the distance between the mobiles on which they reside.

FIGURE 8-19. *One Connection Point is the Attachment Point of the Survey Boat*

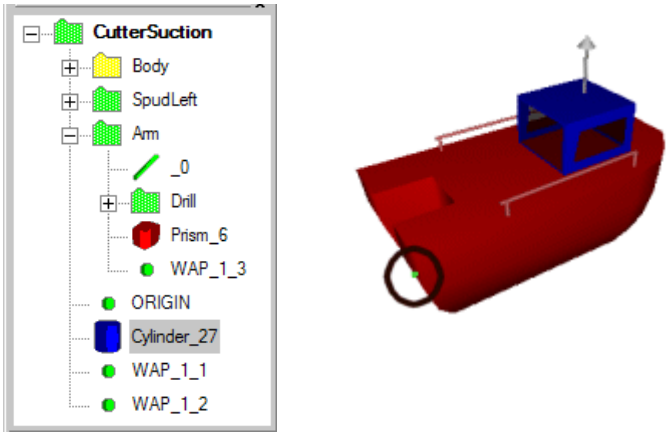


FIGURE 8-20. *A Second Connection Point is the Attachment Point of the Towfish*

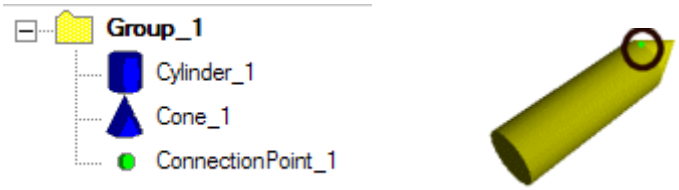
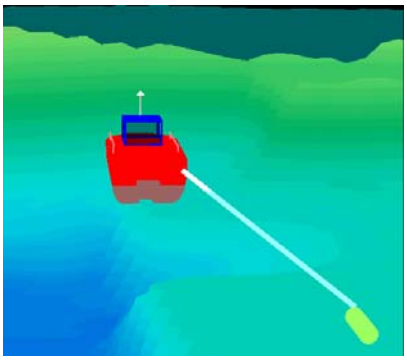


FIGURE 8-21. *Boat and towfish connected by a connector.*



To create connectors:

1. **Click the Connection Point icon**.
2. **Click at the attachment point on the object** in one of the design windows. A blue attachment point will be displayed.

Each 3OD shape must include a connection point *and they must have matching names*. If the default name generated when you create a connector attachment point is different from the connector on your other 3OD shape, you can rename it by right-clicking on the object name, selecting 'rename' and entering the correct name,

Removing Objects from the Custom Shape

Any object can be easily removed from the custom shape design by any of the following methods:

- Select the object and press the Delete key.
- Right-click on the object and select Delete from the pop-up menu.

Setting Object Properties in the 3D Shape Editor

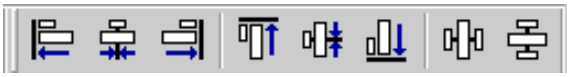
Once you have set an object into your design panes. You will probably need to adjust its size, orientation and position in the design, and possibly its color, transparency, texture or visibility as well. These are the object properties.

You can modify the properties of a selected object or group of objects:

- With tools from the Transformations or Alignment and Distributions tool bars or

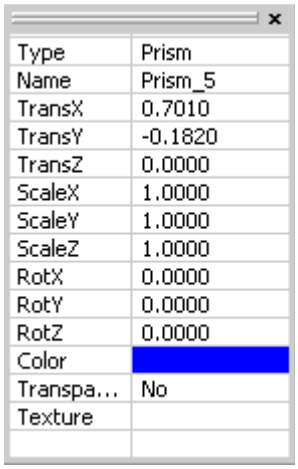
FIGURE 8-22. *Transformations Toolbar*

FIGURE 8-23. *Alignment and Distribution Toolbar*



- By changing the values in the Object Properties.

FIGURE 8-24. *Object Properties*



Type	Prism
Name	Prism_5
TransX	0.7010
TransY	-0.1820
TransZ	0.0000
ScaleX	1.0000
ScaleY	1.0000
ScaleZ	1.0000
RotX	0.0000
RotY	0.0000
RotZ	0.0000
Color	
Transpa...	No
Texture	

Certain attachment points and origins have limited properties in order to preserve their function or because of the nature of the object within the context of the complex shape. In these cases, only select and translation properties and tools will be enabled.

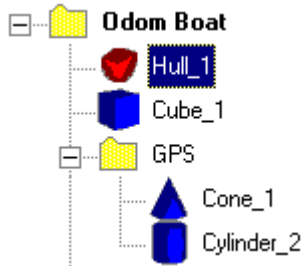
When you want to change any of the object properties, the object or group itself must first be selected. When an object or group is selected, its properties are displayed in the Properties dialog and it is highlighted in the Object Browser and design panes.

To select an object:

- Use the **Select Tool** by clicking the icon then the object in one of the 2-dimensional design pane windows. When the Select Tool is used, the current cursor position is displayed in the status bar.

- Use the **cursor** by clicking on the object or group in the Object Browser.

FIGURE 8-25. *Selecting Objects in the 3D SHAPE EDITOR*



Alignment and distribution, as well as grouping operations, require selection of multiple objects or groups.

To select multiple objects or groups:

Hold your Ctrl key and the multi-select cursor will appear. Click on each object you want to select. (You can click in either the Object Browser or a 2D design window.) The name of each selected object will be highlighted in the Object Browser.

NOTE: All objects or groups must reside within the same group. For example, in this figure, you could select the hull and the GPS group, but you could *not* select the hull and the cone.

When a multiple selection is complete 3D SHAPE EDITOR will enable only operations that can be applied to all of the selected objects:

- **The right-click menu** enables Group, Ungroup, Move Up and Delete.
- **The Object Properties window** enables the Color, Texture, Visibility, Transparency properties, while the positioning properties are disabled. Changes in these properties will be applied to each selected object or group. They will not be applied to subgroups.

NOTE: If a property is different for some of the selected objects, the property will be blank. When you assign a setting, it will then be applied to all selected objects.

If you have selected a group, property changes will only apply to objects directly in that group; sub-groups will be excluded from property modifications.

POSITIONING OBJECTS INTO YOUR CUSTOM SHAPE

You can fine-tune the XYZ positioning and the rotation of an object by adjusting the translation and rotation properties listed in the Object Properties dialog.

TRANSLATING OBJECTS

Translation is simply moving the object to a new position within your design while maintaining its original orientation.

The **transformations tool bar** has three translation tools. Select the appropriate tool for your purpose then use it to drag the object into

position in your 2D design panes. The translation values in the Properties dialog will update accordingly. Which values are affected depends on which tool you use and which pane you use it in.

- The **Horizontal Translation tool** moves the selected object in a straight horizontal line. There will be no vertical change even if your cursor position moves vertically.

  - Used in the **Back /Front or Top/Bottom pane**, this tool affect the TransX value.
  - Used in the **Side pane**, it affects the TransY value.
- The **Vertical Translation tool** moves the selected object in a straight vertical line. There will be no horizontal change even if your cursor position moves horizontally.

  - Used in the **Back /Front or Side pane**, it affects the TransZ value.
  - Used in the **Top/Bottom pane**, it affects the TransY value.
- The **Translation Tool** moves the object in any direction with your cursor.

When the Translation Tool is used, the current position of the selected object relative to the origin of the complex shape is displayed in the status bar.

You can also modify the translation values directly in the Properties dialog. **TransX**, **TransY** and **TransZ** move the object parallel to the X, Y and Z axes respectively.

Translation values of 0,0,0 places the object at the center of the design area.

Rotating Objects

Rotation turns the object around one of the axes. The axis around which it turns depends on the pane in which you use the tool.

The Transformations tool bar contains a **Rotation** tool with which you can rotate the objects in the 2D design panes. The Rotation values in the Properties dialog will update accordingly.

- In the **Top/Bottom pane**, the object rotates around the Z axis.
- In the **Right/Left pane**, the object rotates around the X axis.
- In the **Back/Front pane**, the object rotates around the Y axis.

When the Rotation Tool is used, the current rotation of the selected object is displayed in the status bar.

You can also modify the rotation values directly in the Properties dialog. **RotX**, **RotY** and **RotZ** rotate the object around the X, Y and Z axes, respectively.

NOTE: These angle values are given in the XYZ order convention, meaning that rotations are performed around axis strictly in that order: first around X-axes, then around Y-axes, and finally around Z-axes. When you rotate an object through 2D panes, those three

angles well be recalculated to reflect the given rotation applying the order of rotations convention.

ALIGNING OBJECTS

Alignment is placing two or more objects or groups in a line relative to each other. The 3D SHAPE EDITOR can align objects horizontally or vertically in the top design window.

- **Vertical alignment** is based on their top, center or bottom points.
- **Horizontal alignment** is based on their left, center or right points.

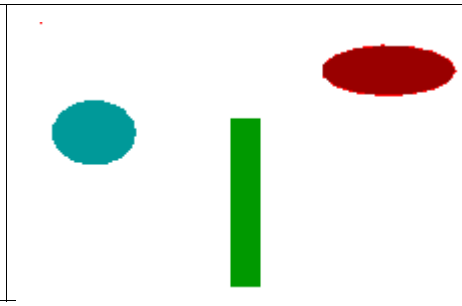
The tools in the alignment and distribution toolbar only become active if you have selected multiple objects or groups, or a combination of both.

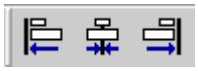
NOTE: Selecting one group is not the same as selecting its component objects.

1. **Select multiple objects or groups:** Hold your Ctrl key and click on each object you want to select. (You can click either in the Object Browser or a 2D design window.) The name of each selected object will be highlighted in the Object Browser.
2. Once you have selected the items you want to align, just **click the icon appropriate for the type of alignment** you want to accomplish.

Table 8-2 shows the effects of each operation. The three objects begin in the original arrangement and are all selected. They are then aligned using one of the six alignment icons.

TABLE 8-2. *Object Alignment*

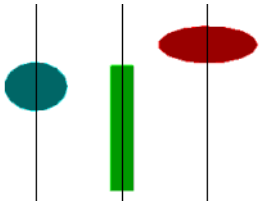
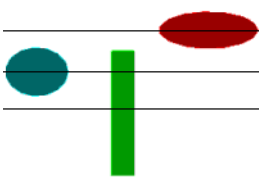
Original Arrangement		

Vertical Alignment		*Top*	*Center*	*Bottom*
Horizontal Alignment		*Left*	*Center*	*Right*

DISTRIBUTING OBJECTS

Distributing evenly spaces objects or groups based on their center points. In Table 8-3, we see that the original arrangement from our previous example has three objects that are both horizontally and vertically distributed.

TABLE 8-3. *Object Distribution*

Horizontal Distribution		
Vertical Distribution		

SETTING OBJECT PHYSICAL ATTRIBUTES

In addition to positioning each object in your design, you can also define what they look like--Color, Transparency and Texture--in the Object Properties.

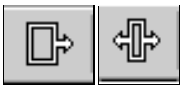
Color, Transparency and Texture properties can also be applied to individual faces of an object by editing the face.

SETTING OBJECT SCALE

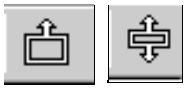
Scaling is changing the size of the object. The Scaling tools in the 3D Shape Editor can be used to scale individual objects or entire groups. (Scale properties are disabled when multiple objects/groups are selected.) The shape can also be further scaled when it is displayed in the 3D TERRAIN VIEWER.

The Transformations tool bar includes several tools you can use in the 2D design panes to scale your object to suit your needs. The Scale values in the Properties dialog will update accordingly. The pane in which you use the tool determines which scale values your adjustments affect.

The Horizontal and Vertical Scale Tools can only be used on objects that have not been rotated. If any of the object rotation properties is other than "0", the program plays a sound, but the tool is useless.

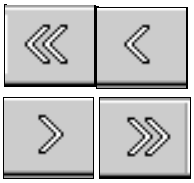


- **Horizontal Scale Tools** expand and contract the object horizontally in the pane. One (single arrow) keeps the side opposite to the one you are dragging in its original position. The other (double arrows) keeps the center of the shape in its original position.
  - In the **Top/Bottom and Front/Back panes**, it affects the ScaleX value.
  - In the **Right/Left Pane**, it affects the ScaleY value.



- **The Vertical Scale Tools** expand and contract the object vertically in the pane. One (single arrow) keeps the side opposite to the one you are dragging in its original position. The other (double arrows) keeps the center of the shape in its original position.
  - In the **Top/Bottom and Right/Left panes**, it affects the ScaleY value.
  - In the **Front/Back Pane**, it affects the ScaleZ value.

When the Horizontal or Vertical Scale Tool is active, the current scale of the selected object is displayed in the status bar.



The **Increase and Decrease Scale Tools** increase and decrease the scale in all three directions. The fast tools (double arrows) change the scale by 10%. The slower tools change the scale by 1%.

You can also modify the scale values directly in the Properties dialog. **ScaleX**, **ScaleY** and **ScaleZ** affect the scale of the object along the X, Y and Z axes respectively.

NOTE: The X, Y and Z scale will be applied before rotation properties. If the object has been rotated, the scales will appear expand/contract the shape in different directions compared to objects that have not been rotated.

Basic Objects have additional properties that are specific to the object type. These properties, with the object's scale properties, determine the final object size. Let's look at the cone properties as an example.

If the **height** of the cone is 2 and the Z Scale is 5, the final height of the cone is 10.

If the **radius** of the base is 0.5, and the X Scale and Y Scale are 5, the base of the cone will be a circle with radius of 2.5. Note that, in this case, if the X Scale and Y Scale are unequal, the base of the cone will be an ellipse instead of a circle.

Now that you have an understanding of the tools, consider how to make a shape that will be displayed at the proper scale in the 3D TERRAIN VIEWER.

Your custom shape should be made to scale in 3D SHAPE EDITOR. It need not be a full scale model because it can be further scaled when it is displayed in the 3D TERRAIN VIEWER.

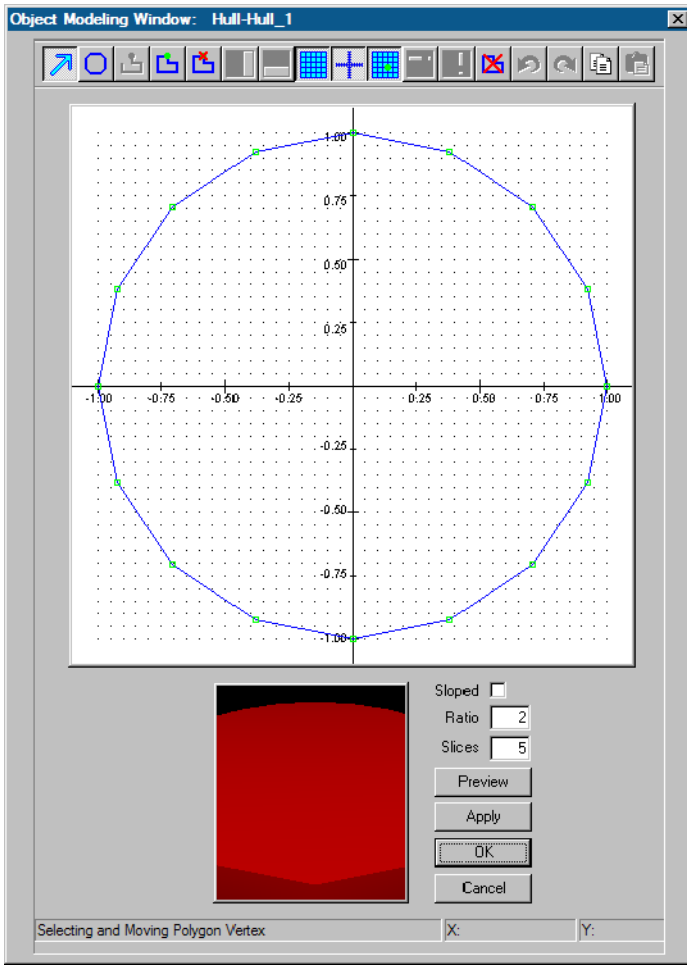
Let's look at the SurveyBoat.3OD that was included in your HYPACK® install. It will be helpful if you turn on your Ortho Tools in your View menu. They display a grid by which you can measure your shape.

If you look at Hull_1, you can see, according to the grid, that it measures 20 x 40 x 6. Let's see how these dimensions were achieved. We have to consider three settings for each dimension:

- Original dimension
- Ratio
- Scale

Double-click Hull_1 to load it in the Object Modeling Window.

FIGURE 8-26. *Hull_1 in the Object Modeling Window*



The original dimension of the hull shape was 2 x 2 x 2 because it was created using the Polygon Tool in the Object Modeling window and the **Default Dimensions**, set in the View menu was 2 units cubed.

The **Ratio** of the top relative to the footprint is 2. This tells me that the X and Y measurements of the hull bottom will be multiplied by 2 for the deck measurements.

In the object properties, we see **X, Y and Z scales** of 5, 10 and 3 respectively.

We multiply all of these values to get the final dimensions of the object.

Scale x Ratio x Original Dimension = Final Dimension

Axis	Original Dimension	Ratio	Scale	Final Dimension
X	2	2	5	20
Y	2	2	10	40
Z	2	1	3	6

When the vessel is displayed in the 3D TERRAIN VIEWER, you can set a scale factor in the Multivessel Settings dialog. For example, if the dimensions of your boat are really 30 x 60 x 9, you would enter a scale of 1.5 to display your vessel in the correct size.

More Information

- "Other Object Type-Specific Properties" on page 8-72

Setting Object Visibility

The Visibility property lets you choose, on an object-by-object basis, which objects in your custom shape are drawn to the 3D SHAPE EDITOR design panels. By default, all visible objects (Visible property is "Yes") in the active group will be drawn to the display.

Additional tools affect multiple objects and groups.

- **VIEW-WHOLE MODEL** displays all visible objects *regardless of which object or group is selected*. This feature is useful when you want to see the spatial relationships between an object in the group you are editing (active group) and object in the surrounding, inactive groups. You will not be able to select objects outside the active group, although you will see them.
- **VIEW-ATTACHMENT POINTS** toggles the Visibility property of all joints and the origin.

A **"Make All Objects Visible"** icon on the tool bar resets all object Visible properties to "Yes" so that all objects can be displayed.

Setting Object Colors

As you build your custom shape you can color the component parts. This can be helpful in distinguishing one object from another within your custom shape. It can also enhance the appearance of your custom shape by making it a bit more realistic.

The **default color** will be used when each new object is created. If you want several objects of the same color, set the default and create them. The same color will appear for each object in the Properties dialog.

To set the default color, click the default color icon on the Model tool bar and select the desired color from the color dialog.

To change the Color Property of any object or group:

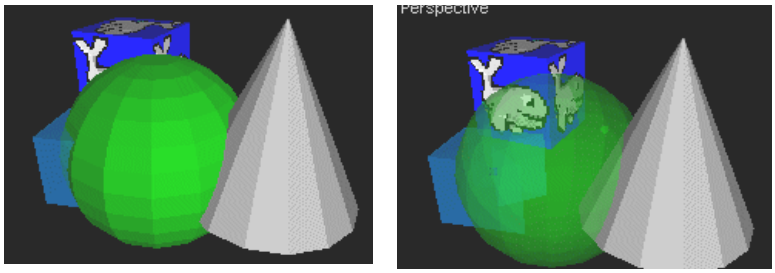
1. **Select the object or group.**
2. **Click the color row under 'Appearance' in the Properties dialog**.
3. **Click the drop-down tab** on the right-hand end of the color row and the color select dialog will appear
4. **Choose the new color** from the color dialog and click [OK].

Setting Object Transparency

Transparency makes the entire object transparent. If this property is set to "Yes", all of the object faces appear transparent. A transparent object will retain the designated color, but you will be able to see objects that are inside or behind them. The following figures demonstrate the difference.

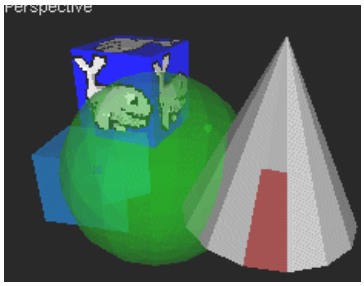
The transparent sphere allows you to see the parts of the cubes and cone that are hidden when it is solid.

FIGURE 8-27. *All Solid Objects (left), Transparent Sphere (right)*



The Transparency property may also be applied to an object face. In the following example, one face of the cone is transparent, which allows you to see inside to the red base.

FIGURE 8-28. *The transparency of the sphere allows us to see the cubes behind it. The Transparent face on the cone in Figure 8-28 allows us to see inside to the base.*



More Information

- "Editing Object Faces in the 3D Shape Editor" on page 8-72

Setting Object Textures

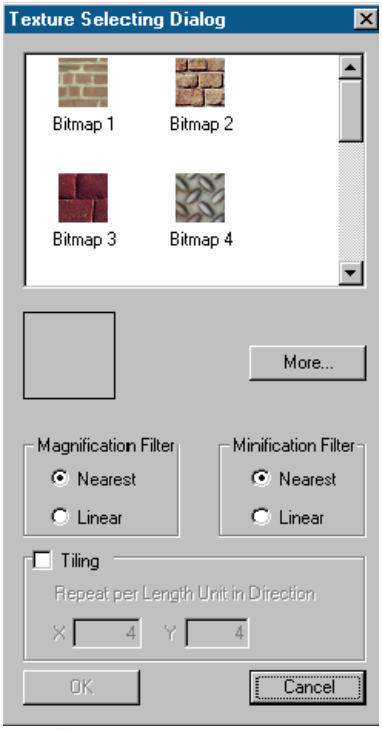
3D SHAPE EDITOR has a selection of graphics that can be applied to your object to provide more realistic texture or a graphic to your shape. Textures may be applied to an entire face, to a user-defined window or to both.

NOTE: Textures override color and transparency properties.

To add a texture or graphic to your shape or window:

1. **Click in the Texture property.** The Texture dialog will appear.

FIGURE 8-29. *Texture Dialog*



2. **Select your texture or graphic** from:
   - From the 3D Shape Editor library.
   - From your own files by clicking [More] and selecting any of several graphic formats:
     - BMP file
     - JPG
     - Static GIF
     - Icons
     - WMF

NOTE: If you include your own texture file in the design, the 3OD file containing the design will not be portable. You must keep the same path for the texture file.

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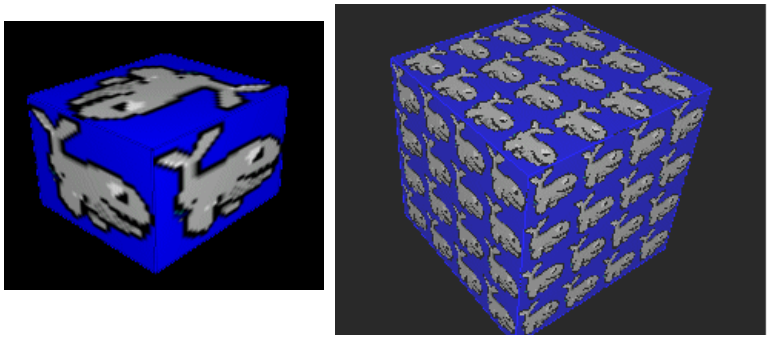
3. **Set your display options**.
   - **Magnification and Minification Filters** are applied as the texture is made to fit the object. The choice is between speed and quality. **Nearest** filter is faster but produces a lower quality appearance than the **Linear** option.
   - **Tiling** causes the graphic to repeat edge-to-edge. The X and Y values determine how many repetitions there will be horizontally and vertically.
   - **Click [OK]** to return to 3D SHAPE EDITOR.

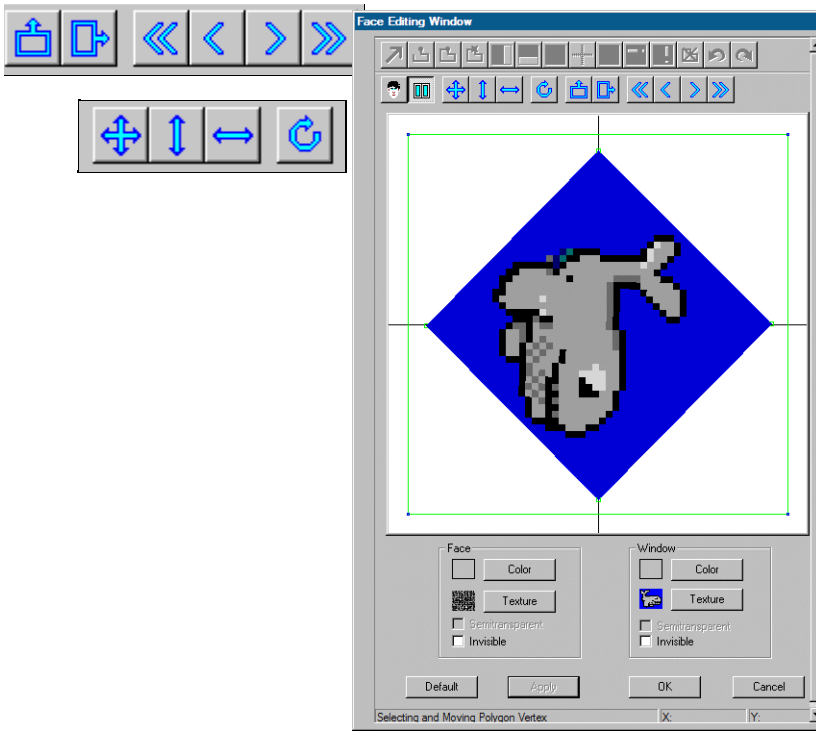
FIGURE 8-30. *Whale Graphic—No Tiling (left), Tiled (right)*



Once the texture is placed, you can further modify its appearance by scaling it, translating it and rotating it on the face or window. To do this:

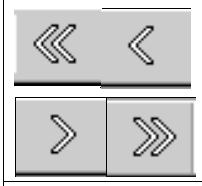
4. **Initiate Texture Editing mode** by selecting the 'Edit Face Texture' (left) or 'Edit Window Texture'(right) icon. The selected texture will display on the drawing board and the scaling, rotation and translation icons will be enabled.

FIGURE 8-31. *Texture Mode Icons*



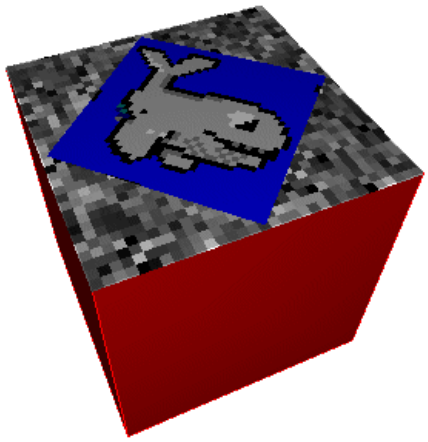
5. **Use the icons to adjust the texture display** in the same way as you would scale, rotate and translate an object

TABLE 8-4. Scale and Rotation Tools

Rotation Tool		The **Rotation** tool rotates the texture.
Scale Tools		The **Increase and Decrease Scale Tools** increase and decrease the scale in all three directions. The fast tools (double arrows) change the scale by 10%. The slower tools change the scale by 1%.
		Horizontal Scale Tool expands and contracts the texture horizontally in the pane.
		The Vertical Scale Tool expands and contracts the texture vertically in the pane.
Translation Tools		The **Horizontal Translation tool** moves the selected texture in a straight horizontal line. There will be no vertical change even if your cursor position moves vertically.
		The **Vertical Translation tool** moves the selected texture in a straight vertical line. There will be no horizontal change even if your cursor position moves horizontally.
		The **Translation Tool** moves the object in any direction with your cursor.

6. **Preview the results** on your shape by clicking [Apply].
7. When you are satisfied, **click [OK]** to close the Face Editing Window.

FIGURE 8-32. Textures applied to both face and window



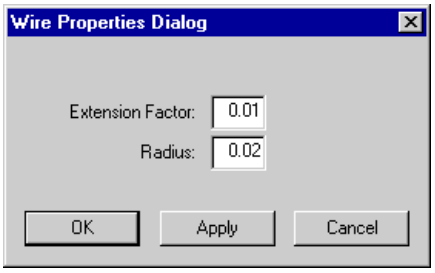
Setting Wire and Extensible Object Properties

Wires, extensible objects and their attachment points have few properties.

The **Attachment Points** have only translation, color and visibility properties, which are set in the same manner as the properties of other object types.

Wires have only two properties that can be modified through the Wire Properties dialog.

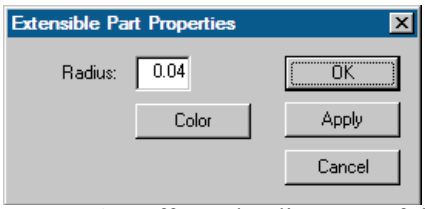
FIGURE 8-33. *Wire Properties dialog*



- **Extension Factor** affects how tightly the wire stretches between the attachment points.
- **Radius** affects the diameter of the wire.

Extensible objects have only two properties that can be modified through the Extensible Parts dialog.

FIGURE 8-34. *Extensible Parts Properties dialog*



- **Radius** affects the diameter of the wire.
- **Color** allows you to modify the color of the object between the defined attachment points. Click [Color] and select a color from the dialog presented.

To set default wire or extensible object properties, which will be applied to any new object of their kind you may create, access the appropriate dialog through the Model menu.

To modify properties of existing wires or extensible objects, access the dialog by either of the following methods. The properties are applied to the entire length of any selected wire or extensible object.

- Right click on one of the attachment points and select Edit/Activate from the menu or
- Double click an attachment point.

Other Object Type-Specific Properties

Basic Objects have additional properties that are specific to the object type. These properties, with the object's scale properties determine the final object size.

For example, if the height of the cone is 2 and the Z Scale is 5, the final height of the cone is 10. If the radius of the base is 0.5, and the X Scale and Y Scale are 5, the base of the cone will be a circle with radius of 2.5. Note that, in this case, if the X Scale and Y Scale are unequal, the base of the cone will be an ellipse instead of a circle.

The following table lists the properties specific to each basic object type and shows which scale properties they affect.

TABLE 8-5. *.Object Properties Affect Scale Values*

Object Type	Properties	Affected Scales
Sphere	Radius	X, Y, Z
Cube	Edge	X, Y, Z
Cylinder	Radius	X, Y
	Height	Z
Cone	Radius	X, Y
	Height	Z
Truncated Cone	Radius—upper and lower	X, Y
	Height	Z
Pipe	Radius	Y,Z
Torus	Radius – inner and outer	X, Z
Tetrapod	Radius—upper and lower	X, Y

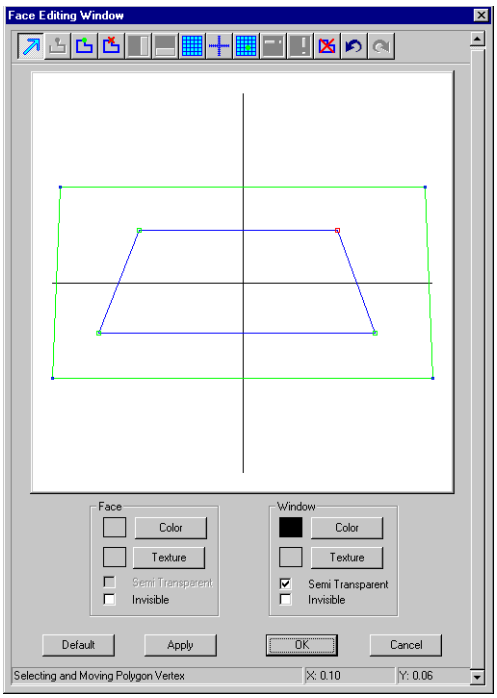
Editing Object Faces in the 3D Shape Editor

When an object is created, all sides are opaque and of the default color. Objects in the world are rarely so. Some sides may be of different colors or textures, or have windows and doors. All of these characteristics can be included in your custom shapes by editing individual object faces.

1. **Access the Face Editing Window** by right-clicking on the face that you want to edit and selecting "Edit Face" from the pop-up menu. The Face Editing dialog appears with an outline of the selected face on the drawing board.

NOTE: This dialog draws the selected face in the largest scale possible without exceeding the size of the drawing board. If you drew this face originally, it will probably be a different scale here.

FIGURE 8-35. Face Editing Dialog



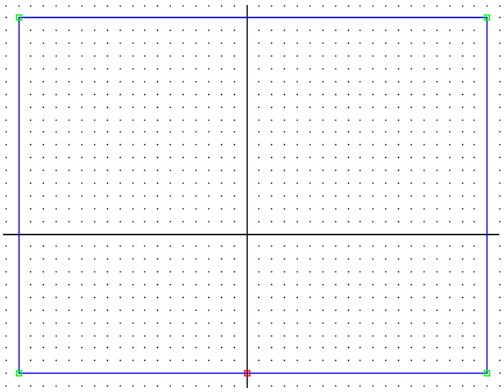
2. **Edit the face.** Color, texture and transparency can be specified for the selected face in much the same way as those properties can be applied for an object. The same drawing tools, and color and texture dialogs that are used for the advanced objects are accessed to modify the face.
   - **To change the face color**, click [Color] and select the color from the dialog that appears.
   - **To add a texture or graphic to a face** click [Texture] and select the texture options for the selected face as you would for an object.
   - **To make the face semitransparent or invisible,** click the corresponding check box.
   - **To create a design or window on the face**.
3. **Draw the window shape within the face** outline using the drawing tools. The Window properties will become enabled.
4. **Set Texture or Color, and Transparency properties for the window shape.** These properties will be applied to the window independently of the face and object properties.
   - **To include more than one window on a side**, you must use an advanced object and define one side with more than one face. Here's an example of how it works.

     Suppose your vessel's cabin has both a window and a door on one side.

     i. **Create the cabin object.** You must use an advanced object. In this case, we'll use a prism.

ii. **Draw a rectangle**, sized to match your cabin, and including a point somewhere between where the window and door will be placed. In the following figure, the bottom edge is divided into two faces by drawing it as a 2-segmented line.

FIGURE 8-36. *Creating Multiple Faces on One Side of an Advanced Object*



iii. **Place the object in the design panes**.

iv. **Right click to one side of the divided face in one of the 2-dimensional design panes and select FACE EDIT**. The Face Edit dialog will appear. Notice the relative dimensions of the face it represents. If it isn't the shape you would expect based on what you've drawn, you may have the wrong face.

v. **Draw the window**, set the window color and transparency and click [OK].

vi. **Repeat steps 4 and 5 at the opposite end of the side** (the other face) for the door.

FIGURE 8-37. *Drawing the Window and Door.*

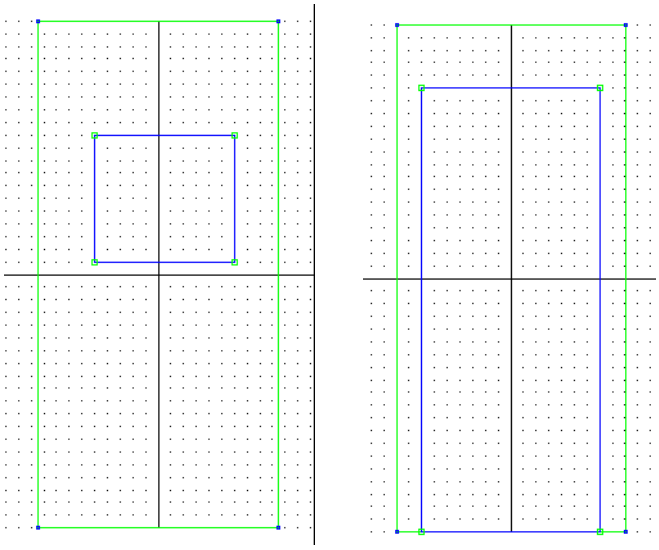
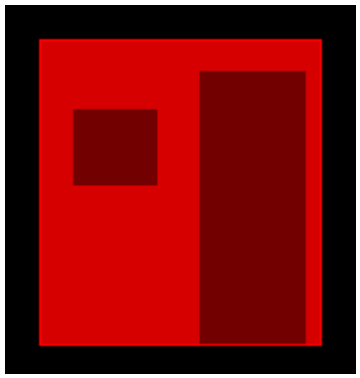


FIGURE 8-38. Viewing the resulting cabin face in the design pane



5. **Preview your work** by clicking [Apply] and looking in the design panes. This provides the opportunity to make further modifications if necessary before leaving the dialog.
6. **Save your changes and return to 3D SHAPE EDITOR** by clicking [OK].

More Information

- "Setting Object Textures" on page 8-67

Renaming Objects in your Custom Shape

As each object is placed in your design window, it also appears in the Object Browser. The 3D SHAPE EDITOR automatically assigns a unique name according to the object type and the number of that type of object already in your design. If you prefer a different name, you can:

- Enter a new name in the Object Properties dialog.
- Right-click the object name in the Object Browser, select "Rename" and type in your preferred name.
- Select the name of a selected object in Object Browser, and change it.

NOTE: Each object in a custom shape must have a unique name.

Merging 3OD Files

FILE-IMPORT 3OD imports the design in a user-selected 3OD file into another.

1. **Open the 3OD file** into which you want to add the other.
2. **Select FILE-IMPORT 3OD choose the file to add in**. A copy of the imported file will be added to the active group of your current 3OD file. The imported file will not change.

If any object names in the imported and destination file match, the imported objects will be renamed by appending a ".1" to ensure unique names for each object in the shape.

GROUPING OBJECTS IN YOUR CUSTOM SHAPE

Grouping allows you to join two or more objects in your design into a subgroup. Groups can be created either before or after their member objects have been created. You can then activate a group or subgroup for editing and work only with the member objects and subgroups.

NOTE: Activating a group or object is different than selecting a group or object. Active groups are indicated with bold text in the Object Browser and are available for editing.

To activate a group:

- Double-click on the object or group in the Object Browser.
- Right-click on the object or group in the Object Browser or in a design pane and select Edit/Activate.
- Right-click on a selected sub-group and select Parent Group

When a group is activated, the activated group of objects will be highlighted in the design panes. You can:

- **Add or delete objects** in the group.
- **Modify the properties of individual objects or subgroups** within the active group.
- **Translate or rotate subgroups** of the active group as a unit within the design while maintaining their size and position relative to each other.
- **Ungroup** the components of the group.

GROUPING EXISTING OBJECTS

You can create several objects, and group them afterward into one or more groups. This allows you to build the custom shape, or a portion of it at a time, then organize the component objects into groups. These groupings will be subgroups of the folder in which they began. You can create multiple layers of groups and subgroups to suit your purposes.

If you are building a complex shape such as a dredge, we recommend that you build a few objects at time, then group them. This method is less confusing and allows you to move groups as you build, which can often be easier and more efficient

1. **Build your custom shape without grouping your objects.** All component objects will initially be in Group_1.
2. **Select the objects to be included in a subgroup** by holding the Control key and clicking on each object in the design window or Object Browser.
3. **Click the "Group Selected Objects" Icon** on the Advanced Objects toolbar. The selected items will be grouped and the Object Browser will be updated accordingly.

The following figures illustrate how objects can be grouped as you build your custom shape..

FIGURE 8-39. *Groups Viewed in the Object Browser*

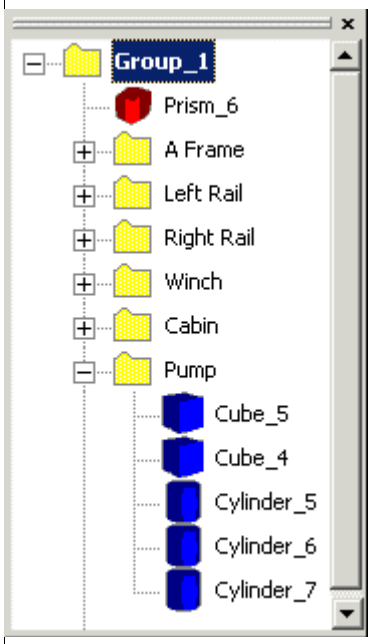


FIGURE 8-40. *A prism forms the dredge*

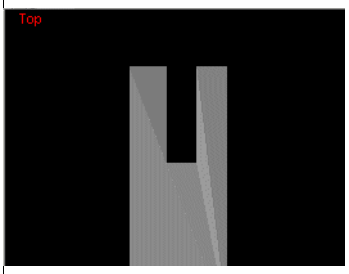


FIGURE 8-41. *Add a prism for the cabin and 2 cylinders to form the A-Frame*

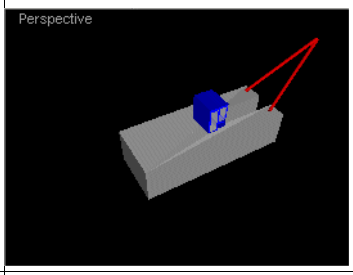


FIGURE 8-42. *Add cubes and cylinders for the pump system*

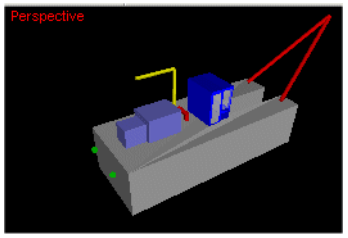
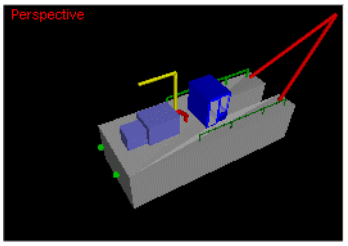


FIGURE 8-43. *Several cylinders create each railing and the winch*



GROUPING OBJECTS AS YOU BUILD YOUR CUSTOM SHAPE

If you prefer, you can create empty folders then create the objects that belong in them. This means you can either:

- Create the entire hierarchy of groups, then add the shapes appropriate to each afterward or
- Create one new group at a time and fill each one as you build your custom shape.

1. **Right-click on the group in the Object Browser where you want to create a subgroup.** A pop-up menu will appear.
2. **Select "Add Empty Subgroup"**. A new Group will be created under the original group.
3. **Activate the group to which you are adding the new object.** (The group name will be bold.)
4. **Create the object.** The object will be added to the active group.

When you activate a sub-group of objects, all others in your design are hidden. This sometimes makes it difficult to position one group relative to another. In this case, select VIEW-WHOLE MODEL to show all objects regardless of which group is active.

NAMING YOUR GROUPS

As each Group is created, by default, it is named "Group_*GroupNumber*". You can rename any group by right clicking on the group name and selecting "Rename". The group name will become editable. Just type in the new name and press the Enter key.

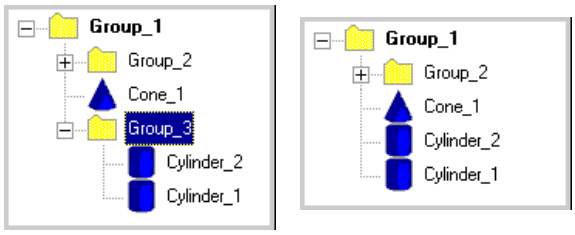
UNGROUPING OBJECTS

Ungrouping moves the group members to the parent group and removes the group folder from the Object Browser.

Just select the group in the Object Browser and click the Ungroup icon in the Advanced Objects toolbar.

In this example, the objects in Group_3 are ungrouped and become members of Group_1, the parent group.

FIGURE 8-44. *Ungrouping-- Before (left) and After (right)*



NOTE: This option is not available for green folders in mobile objects created through a 3D SHAPE EDITOR template.

MOVING OBJECTS BETWEEN GROUPS

You can easily move selected objects from one group to another in the Object Browser. Just click on the object and drag it to the desired group's folder.

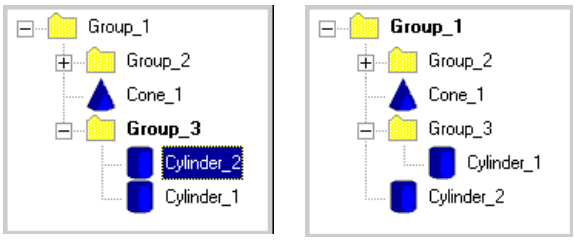
Objects that are members of a subgroup can be moved into the parent group by:

- Selecting the subgroup object in the Object Browser and clicking the Move Up icon in the Advanced Objects toolbar.

- Right-clicking on the subgroup object and selecting 'Move to Parent'.

In this example, Cylindar_2 in Group_3 moves up to Group_1, the parent group.

FIGURE 8-45. Moving Up-- Before (left) and After (right)



NOTE: This option is not available for mobile objects or attachment points created through a 3D SHAPE EDITOR template.

SAVING YOUR CUSTOM 3D SHAPE FILE

When you build a custom shape, you first save it to a 3OD (3d Object Document) file. This is an ASCII text file which saves all of the information that allows you to later:

- reopen it using FILE-OPEN or
- import it into an active group using FILE-IMPORT.

It is wise to save your work in this format periodically as you work to insure against losing your work due to some system failure. You should also, of course, save the finished creation to a 3OD file.

You can overwrite the same file each time, or use FILE-SAVE AS to save incremental records of your shape as it progresses.

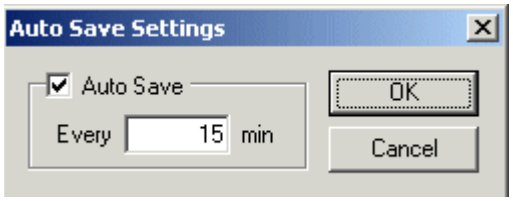
You can save your design manually or automatically to the default Hypack\Shapes directory or to any other directory. The program will "remember" the last location to which you saved your 3OD file, or from which you opened your last 3OD file. This may save you some navigating through the file hierarchies every time you save your work outside of the HYPACK® default location.

To save your 3OD files manually, select FILE-SAVE, or FILE-SAVE AS and name your file.

To save your 3OD files automatically at user-defined intervals.

1. **Select FILE-AUTOSAVE** and the Auto Save dialog will appear.

FIGURE 8-46. Auto Save Dialog



2. **Check the Auto Save check box and enter a time interval** (in minutes) at which your design should be saved.
3. **Click [OK]**.

NOTE: If this option is selected and you have not yet named your shape, a dialog will appear after the first time interval for you to provide a name.

You may also save selected objects from your design. Select FILE – EXPORT 3OD and name the new 3OD file.

ADVANCED CHANNEL DESIGN

The ADVANCED CHANNEL DESIGN program is useful in designing complex channels for use as surfaces in volume computation in the TIN MODEL program or to provide a real-time dredging guide. You can define any channel shape either by manually describing it or by importing data from planned line files, channel plan files (*.PLN), template files (*.TPL), border files or XYZ format files.

When the channel design is complete, it will be saved with a ADVANCED CHANNEL DESIGN can also extract and export XYZ data based on the Channel file information.

RUNNING ADVANCED CHANNEL DESIGN

1. **Open the program** by selecting UTILITIES-ADVANCED CHANNEL DESIGN.
2. **If you wish to access an existing file, select FILE-OPEN and select your Channel File**.
3. **Select WINDOW-NODES and enter (or edit) the node information**.

   NOTE: SURVEY supports up to 250 nodes in a CHN file.

4. **Select WINDOW-FACES and enter (or edit) the face information**.
5. **Check your faces** by selecting FACES-CHECK FACES in the Faces dialog. The program will check each face for the following standards:
   - All nodes are in the same plane
   - Face is convex
   - Nodes are defined in counter-clockwise direction

NOTE ADVANCED CHANNEL DESIGN also offers a number of conversion routines that import channel information from 3-dimensional planned lines, channel plan (*.PLN) files and channel template (*.TPL) files.

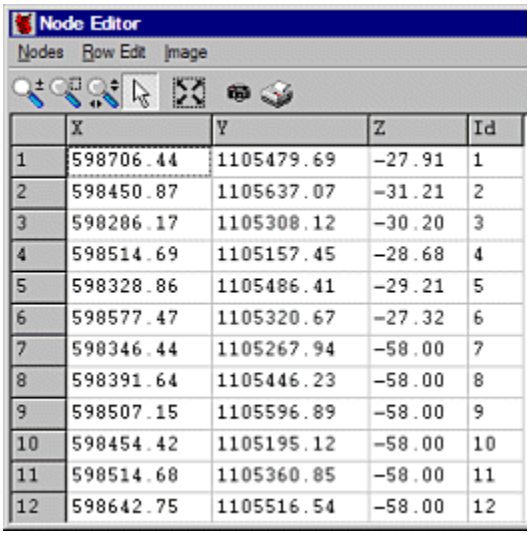
6. **If you plan to use this channel information to calculate volumes by zone, define your zones.**
7. **Save your file** by selecting FILE-SAVE or FILE-SAVE AS and naming your file. The data will be saved with a CHN extension to the directory of your choice. Typically, it would be stored to your project directory.

ENTERING NODE DATA IN ADVANCED CHANNEL DESIGN

Nodes are points where any of the faces of your channel surface have a corner.

1. **Select WINDOW-NODES** to define the nodes of your channel. A four-column spreadsheet appears.

FIGURE 8-1. *Node Editor*



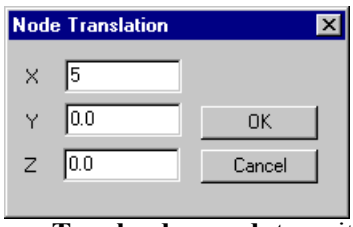
	X	Y	Z	Id
1	598706.44	1105479.69	-27.91	1
2	598450.87	1105637.07	-31.21	2
3	598286.17	1105308.12	-30.20	3
4	598514.69	1105157.45	-28.68	4
5	598328.86	1105486.41	-29.21	5
6	598577.47	1105320.67	-27.32	6
7	598346.44	1105267.94	-58.00	7
8	598391.64	1105446.23	-58.00	8
9	598507.15	1105596.89	-58.00	9
10	598454.42	1105195.12	-58.00	10
11	598514.68	1105360.85	-58.00	11
12	598642.75	1105516.54	-58.00	12

2. **Enter (edit) the XYZ position and name of each node.** The first three columns are X, Y and Z, and they only accept numerical values. Positive Z values go downward. The ID Field is alphanumeric and saves the node name. This may be up to four characters long, should be unique for each line and should not be left empty. It is case-sensitive.

NOTE: SURVEY limits CHN files to 250 nodes.

- **To enter the information manually:**
  - **To insert a row**, click in the row below where you want to insert. Select ROW EDIT-INSERT and a blank row will appear above the cursor.
  - **To re-order rows** use ROW EDIT-CUT and ROW EDIT-PASTE.
  - **To invert the depths** select NODES-REVERSE Z.
  - **To shift the channel:**
    i. **Select NODES-TRANSLATE**. The Node Translation dialog will appear.
    ii. **Enter the translation constant for each coordinate direction you want to shift your channel and click [OK].** This constant will be added to all values of that coordinate type. For example, if you enter 5 in the X field, all X coordinates in the node spreadsheet will increase by 5.

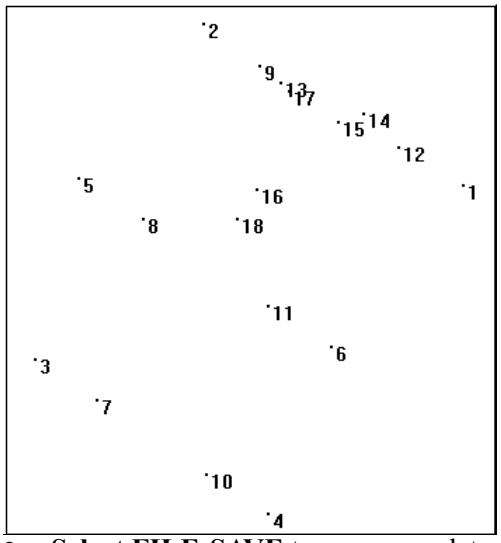
FIGURE 8-2. Node Translation Dialog



- **To reload your data** as it was at the last save, select NODES-RELOAD. So if you save your work in stages when you are satisfied with it, you can revert back to that point if necessary.
- **To import all or some of the data**, use the FILE-ADD NODES feature. You can import:
  - X,Y positions of the waypoints from any Planned Line file.
  - X, Y, Z positions of the nodes from any channel file (*.CHN).
  - X,Y,Z positions from an XYZ format file.

As the nodes are entered in the spreadsheet, they will be drawn and labeled with their IDs in the area to the right of the spreadsheet to show you their positions relative to each other. You can zoom in and out on this display using the plus ("+") and minus ("-") keys respectively.

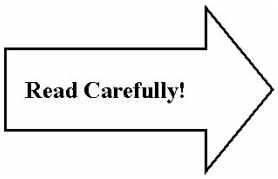
FIGURE 8-3. Nodes Drawn in the Nodes Dialog



3. **Select FILE-SAVE** to save your data temporarily only.
4. **Select FILE-EXIT** to return to the Advanced Channel Design shell.

ENTERING FACE DATA IN ADVANCED CHANNEL DESIGN

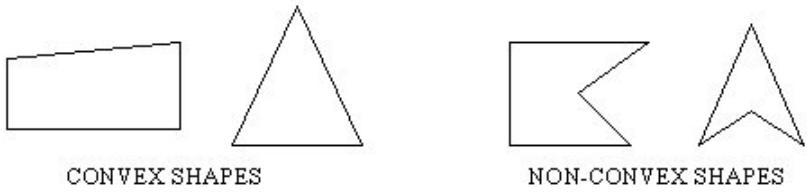
A face is defined by a closed polygon line.



In ADVANCED CHANNEL DESIGN, a face is:

- Represented by a space delimited sequence of points in counter clockwise order.
- *All faces should be convex* to ensure the volume calculation program works correctly. Every non-convex shape can be composed of two or more convex shapes.

FIGURE 8-4. *Convex Shapes*

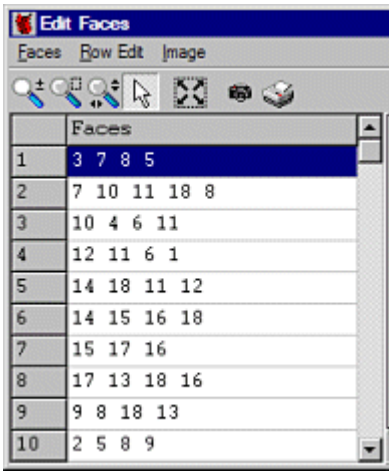


- All points are in the same plane.

To describe the faces of your channel:

1. **Select WINDOW-FACES**. The Faces Editor will appear.

FIGURE 8-5. *Edit Faces dialog*



2. Use **the Node point names to define the faces of your channel.** Describe a face by entering point names in counter clock-wise order and separated with spaces in the spreadsheet.
   - **Type the nodes directly** into the spreadsheet.
     OR
   - **Use the mouse to define your faces**. Hold the Shift key and click the mouse on the nodes for each face in counter-clockwise order.

ROW EDIT-INSERT, ROW EDIT-CUT, ROW EDIT-PASTE work in the same manner as in the Nodes Dialog.

As the faces are entered in the spreadsheet, they are drawn in the area to the right of the spreadsheet. You can zoom in and out on this display using the mouse wheel or the plus ("+") and minus ("-") keys respectively.

FIGURE 8-6. *Faces Drawn in the Faces Dialog*

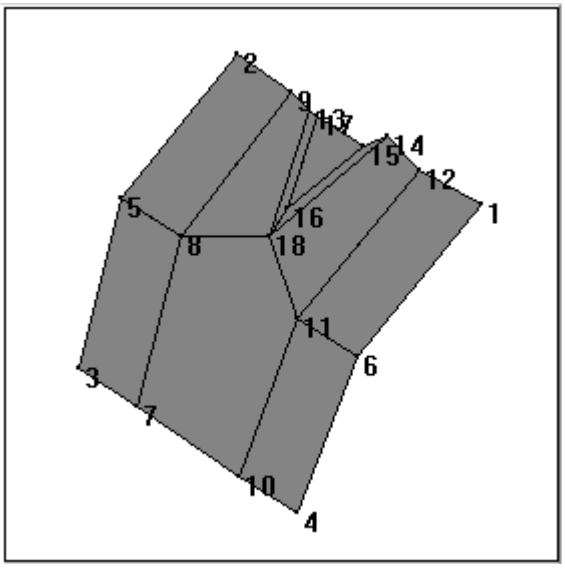
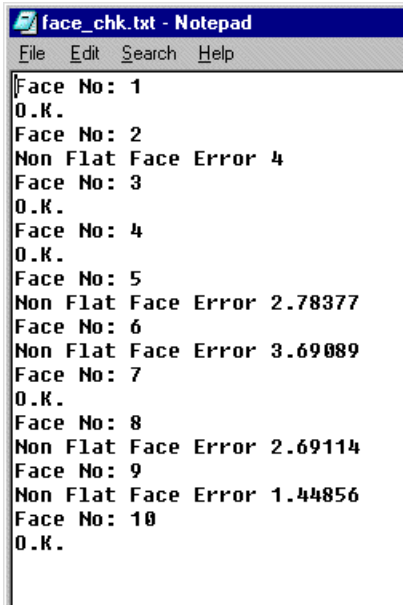


IMAGE-REDRAW refreshes the drawing. All faces should be filled with gray when you are done. If the drawing is incomplete, return to the Faces Editor to fill in the missing faces. If you have nodes that you did not use to define any of the faces, remove them by selecting FACES-REMOVE UNUSED NODES.

3. **Check your faces.** Select FILE-CHECK FACES. The program will check each face for the following standards:
   - is convex,
   - has all points in the same plane and
   - has nodes defined in counter-clockwise manner.

   A text file (face_chk.txt) will be created and displayed in Notepad with the results.

FIGURE 8-7. *Checking the Faces*



Non Convex Shape Error indicates that the face is concave. To correct this, the face must be divided into two or more convex shapes. You can do this by manually editing the faces in the spreadsheet or by using the Split function.

a. **Select the offending face in the Face Editor** by right clicking the face and selecting Select from the pop-up menu.

b. **Right click the selected face and select Split**. The program will divide the face.

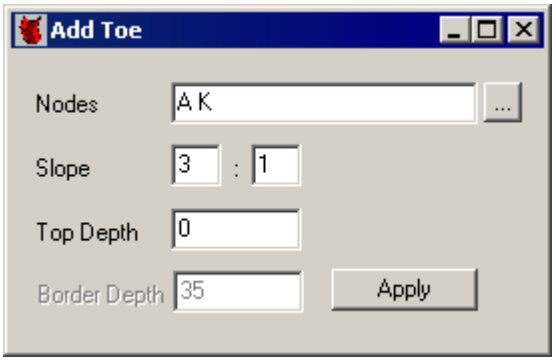
NOTE: You should check to be sure that both resulting shapes are now convex. If the original face was particularly complex, you may need to create more than one split to eliminate all concave shapes.

Non-flat Face Error indicates that all the nodes are not in the same plane. The number following the message tells you the distance (in survey units) that the nodes vary. It's up to you how much error your survey will tolerate. You can choose to leave it or correct the node.

Orientation Error means that the nodes were described in clockwise manner. *This will not affect the volumes calculations*, but when you select WINDOW-3D VIEW, faces with orientation problems will be blue. To correct this, select FACES-FIX FACE ORIENTATION.

4. **Use FILE-ADD TOES** to add toe lines to your channel.

FIGURE 8-8. Adding the Toes



a. **Enter the nodes** at each end of the side of a face where you want to add the toe.

NOTE Imagine that you are standing on the first node looking toward the second. The toe will slope toward the left of the line defined by those points so you should keep that in mind as you enter the nodes.

---

b. **Enter the Slope and Top Depth**.

c. **Click [Apply]** and the program will compute the size and position of the toe and assign names to the outside corners.

5. **Save your faces** temporarily by selecting FILE-SAVE.
6. **Return to the ADVANCED CHANNEL DESIGN shell** by selecting FILE-EXIT.
7. **Save your Channel File** when you are finished by selecting FILE-SAVE or FILE SAVE AS and naming your file. The data will be saved to the project directory with the CHN extension.

CREATING CHANNEL ZONES

If you are using ADVANCED CHANNEL DESIGN to build a channel file, your project area is probably irregular to some degree. Meaningful volumes calculations in such a channel add an extra challenge.

A TIN-to-channel comparison in the TIN MODEL program typically reports a volume for each face of your channel. In a complex channel, it might be more helpful for you to define the areas in your channelfor which volumes will be calculated. That is exactly what we do with channel zones.

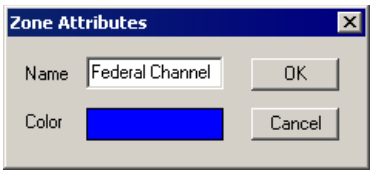
In CROSS SECTIONS AND VOLUMES, we calculate the volume in each zone for each section.

The TIN MODEL and CROSS SECTIONS AND VOLUMES programs can both calculate volumes of user-defined channel zones.

Once you have defined your project area, you can define your channel zones in ADVANCED CHANNEL DESIGN as follows:

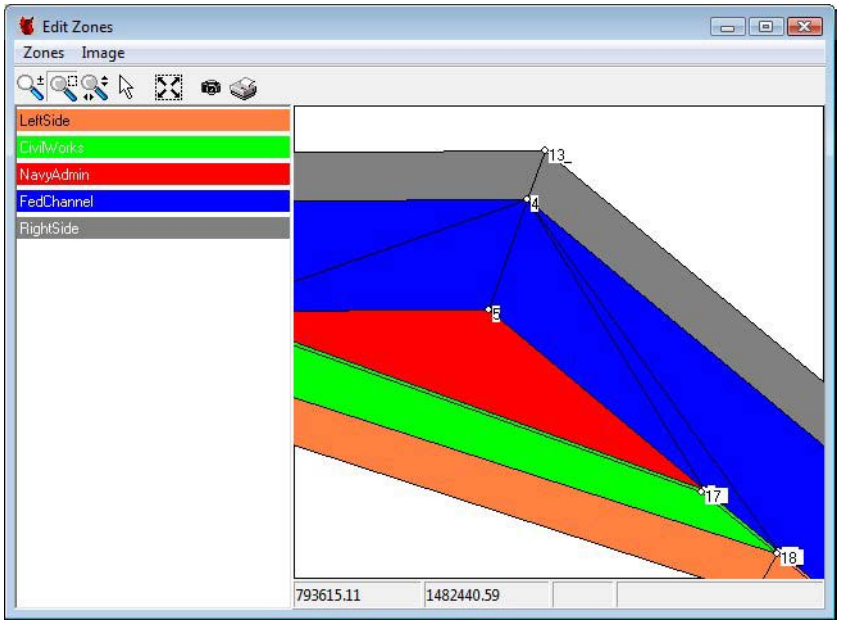
1. **Open the Edit Zones window** by selecting WINDOW-ZONES. The graphic will display your channel with a cross-hatched pattern.
2. **Name each reporting zone.**
   a. **Select ZONES-ADD**. The dialog will appear.

FIGURE 8-9. *Naming your Zones*



   b. **Enter the zone name**.
   c. **Choose the zone color** by clicking in the color box and selecting from the colors dialog. The color is only for display purposes to help you on the next step.
   d. **Click [OK]**.
   e. **Repeat the process for each zone**.
3. **Assign each face in the channel file to a zone**.

FIGURE 8-10. *Assigning Zones*



   a. **Select the target zone** by using the arrow tool, click on the zone name to .
   b. **Click on each face that belongs to that zone.** ADVANCED CHANNEL DESIGN will paint the faces with the zone color as you click on each one.

c. **Repeat the process for each zone**.

IMPORTANT! Be sure every face has been assigned to a zone.

4. **Save the channel.** In the ADVANCED CHANNEL DESIGN shell, select FILE-SAVE and name your file. It will be saved, by default, to your project folder.

If you plan to calculate volumes in the CROSS SECTIONS AND VOLUMES program, you must also generate a Zone Edge Listing (ZEL) file.

The **zone edge listing (*.ZEL)** file is an ASCII text file that contains a listing of where each line crosses each zone boundary and each inflection point of the model within a zone boundary. CROSS SECTIONS AND VOLUMES reads the ZEL file for the template information and generates volume quantities based on that listing.

To generate a Zone Edge Listing:

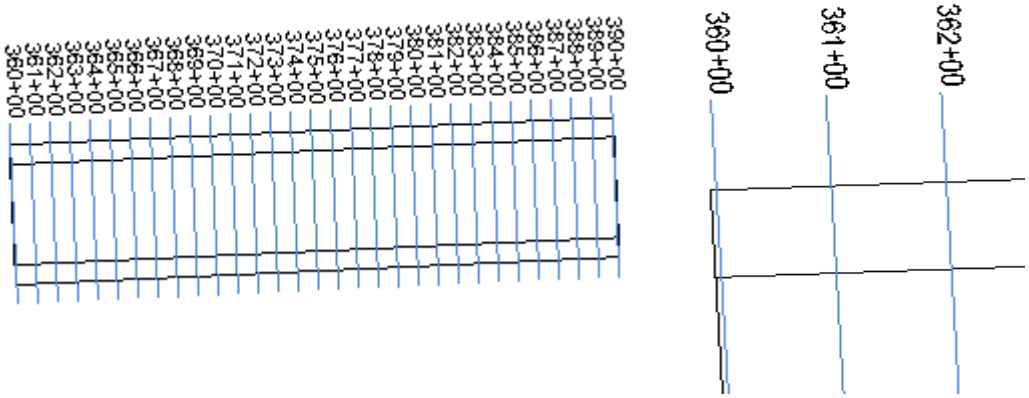
You will need the following:

- The survey line file used to collect your data.

IMPORTANT: The line names in the ZEL file must match the line names of the base survey in CROSS SECTIONS AND VOLUMES.

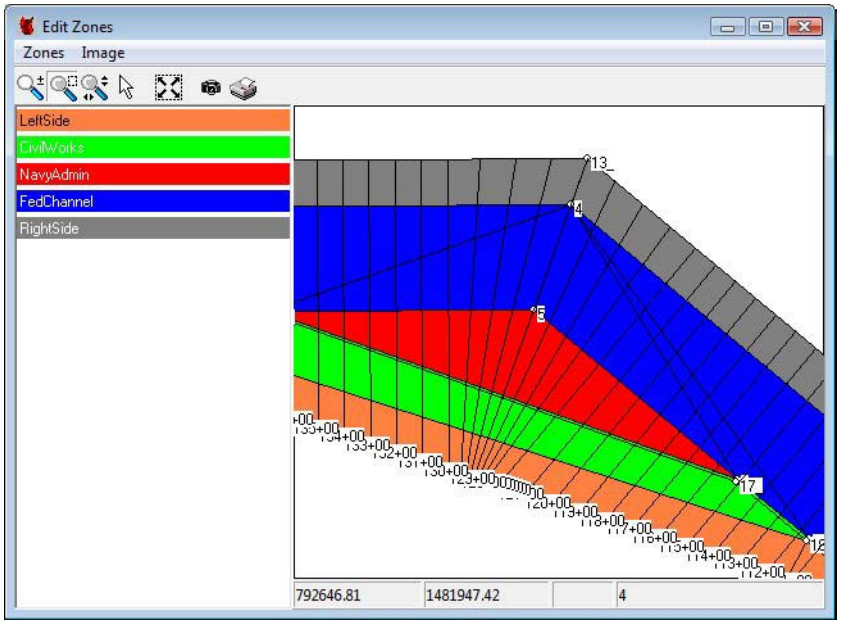
- A channel file (*.CHN) that meets the following specifications:
  - Each face must be assigned to a zone.
  - It must begin before the first survey line and past the last line in your survey line file.
  - The survey lines must extend past the top-of-bank in the channel file.

FIGURE 8-11. *The last survey line falls inside the channel and extends beyond the top-of-bank. Full Channel and Line Files (left), Close-up view (right)*



1. In the Zones window, **import your survey line file** by selecting ZONES-IMPORT LINES and selecting your survey line file. The survey lines will be superimposed on your channel design in the Zones window.

FIGURE 8-12. *Planned Lines Imported onto a Zoned Channel*



2. **Select ZONES-EXPORT ZEL and name your file.** It will be saved to the project folder.

More Information

- "Volumes by Zone in CROSS SECTIONS AND VOLUMES" on page 7-74
- "TIN-to-Channel Volumes with a Zoned Channel" on page 7-159

IMPORTING CHANNEL TEMPLATE INFORMATION TO ADVANCED CHANNEL DESIGN

ADVANCED CHANNEL DESIGN includes a few routines that enable you to convert channel template information from one HYPACK® format to another. These routines include converting the following file types to Channel Files:

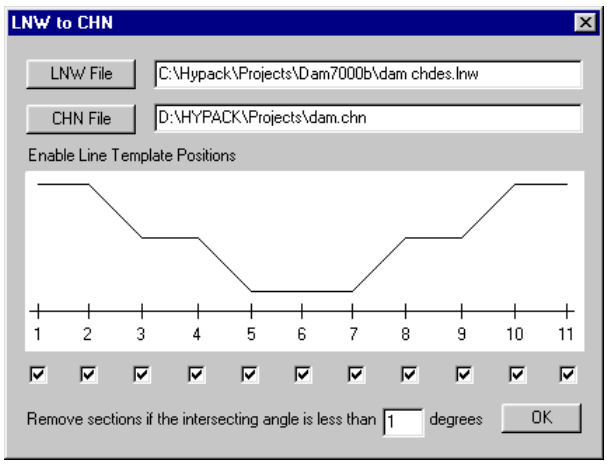
- **3-Dimensional Planned Line files** from CHANNEL DESIGN or LINE EDITOR.
- **Channel Plan files** (*.PLN) from CHANNEL DESIGN.
- **Template files from** CROSS SECTIONS AND VOLUMES or LINE EDITOR.

CREATING A CHANNEL FILE FROM A PLANNED LINE FILE IN ADVANCED CHANNEL DESIGN

You can create a Channel File (*.CHN) from a Planned Line File with template information. ADVANCED CHANNEL DESIGN then places a node at each point where the Line File intersects with an inflection point.

1. **Create a 3-dimensional Planned Line file.** This is typically done in CHANNEL DESIGN, but may also be created in the LINE EDITOR.
2. **In ADVANCED CHANNEL DESIGN, select FILE-LNW to CHN**. The LNW to CHN dialog will appear.

FIGURE 8-13. *LNW to CHN dialog*



3. **Click [LNW File]** and select the Planned Line file from the File Selection dialog.
4. **Click [CHN File]** and name the Channel file (include the path) in the File Selection dialog.

Beware!

5. ***BEWARE!*** If you select an existing file, it will be overwritten!**Modify your template** (optional). You can use the inflection point checkboxes to customize the creation of your channel file. This option is useful when you are doing TIN-to-Channel volumes computations but need separate volumes for certain areas. (For example, you may want only the volume for the left toe.) In this case, *select the check boxes corresponding to inflection points that describe parts of the channel that you want to include*. The following table gives you a few examples.

Volumes Area	Checked Nodes
Left of Toe	1-5
Left of Center	1-6
Center Channel	5-7
Right of Center	6-11
Right Toe	7-11

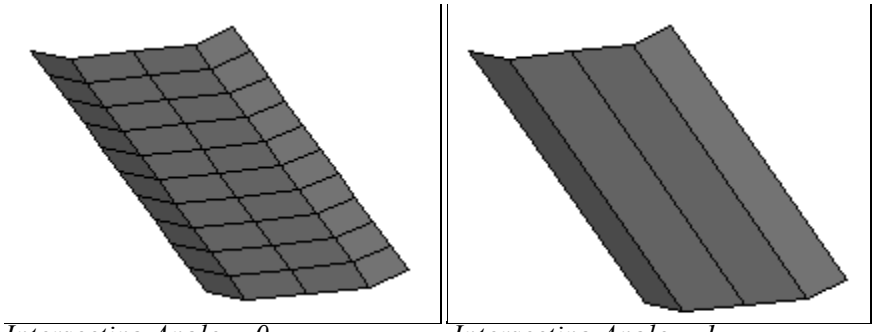
6. **Ignore consecutive, matching Planned Lines** (optional). This is done by entering an angle measurement after *Remove sections if the intersecting angle is less than…* field. There may be several consecutive, parallel or near parallel lines of the same shape in your Line File. If you do not need a separate volume for each section, you can speed the calculations and simplify your report by omitting the lines that are parallel, or nearly so, and have matching shapes.

   The angle is measured where two non-parallel lines would intersect if their ends were to extend far enough. (Parallel planned lines do not intersect so the angle would be 0. A value of zero will include all lines from the Planned Line File.)

   - **If the angle created is greater than the measurement specified**, the line will be included in the CHN file.
   - **If the angle created is less than the specified angle**, it is close enough to parallel for your purposes and the line will be omitted.

     The first and last line of the Planned Line File will never be omitted. The following figures show the difference in a channel created with a setting of 0 versus a setting of 1 degree.

FIGURE 8-14. *Creating a Channel File without Near Parallel Sections.*



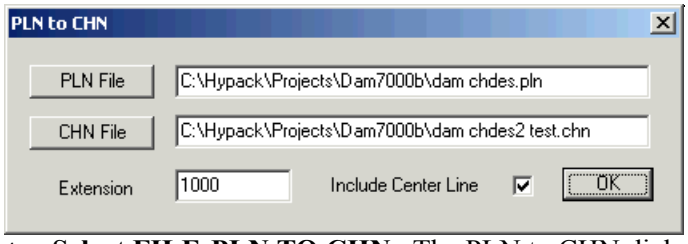
Intersecting Angle = 0 *Intersecting Angle = 1*

7. **Click [OK]** and the Channel File will be created and saved to the specified directory.

Creating a Channel File from a Channel Plan File in Advanced Channel Design

You can create a Channel File (*.CHN) from a Channel Plan File (*.PLN). Channel Plan files are created in CHANNEL DESIGN. They contain all of the channel template information entered in the spreadsheets when you create a planned line file using CHANNEL DESIGN. ADVANCED CHANNEL DESIGN reads the inflection point information and uses it to create the Channel File.

FIGURE 8-15. *PLN to CHN dialog*



1. **Select FILE-PLN TO CHN.** The PLN to CHN dialog will appear.
2. **Complete the dialog and click [OK]**.
   - **Click [PLN File] and select the Channel Plan File** from which you want to read the template information.
   - **Click [CHN File] and name your new Channel File** including the path to the directory where it will be saved.
   - **Extension:** Adds additional faces to cover the specified distance from the toes described in the PLN file. If you leave the field empty, no extensions will be created.
   - **Choose whether to include the center line** information.
3. **Verify the results** in the 3DView window by loading the resulting file (FILE-OPEN) and taking a look (WINDOW-3D VIEW).

FIGURE 8-16. *Original Channel*

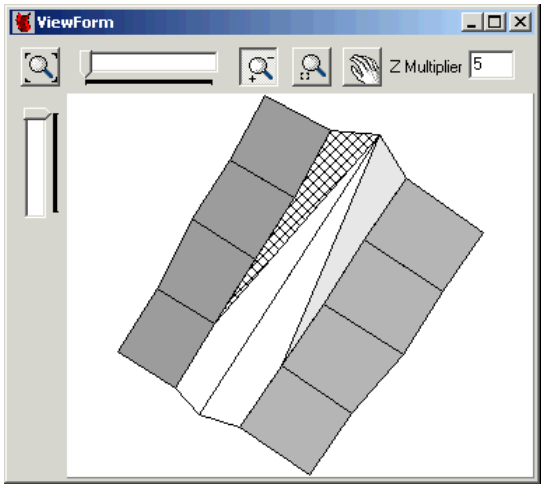


FIGURE 8-17. *Original Channel with Extensions*

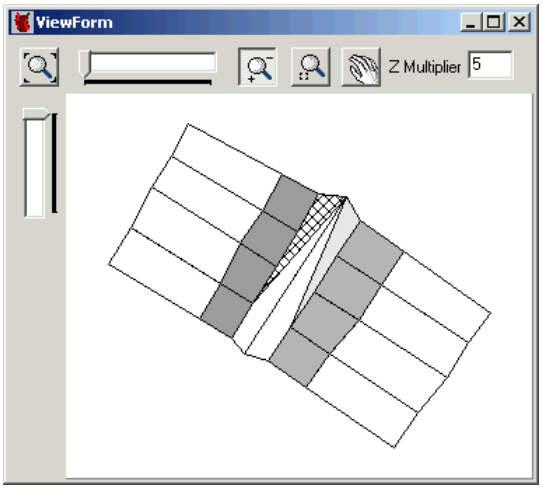
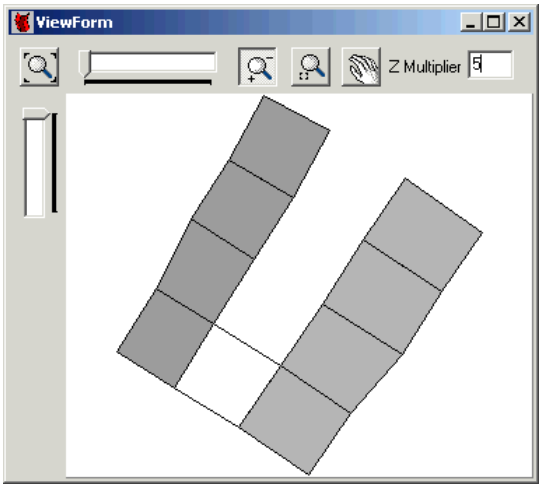


FIGURE 8-18. *Original Channel with No Center Line*

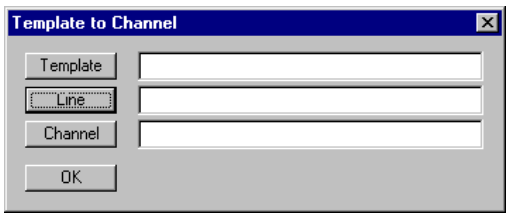


CREATING A CHANNEL FILE FROM A TEMPLATE FILE IN ADVANCED CHANNEL DESIGN

Template information can be imported to ADVANCED CHANNEL DESIGN to create a Channel File. Template information can come from:

- A Template file (*.TPL), created in the CROSS SECTIONS AND VOLUMES Template Editor or in the Template tab of LINE EDITOR.
- A 3-dimensional Planned Line file, created either in CHANNEL DESIGN or in the LINE EDITOR.

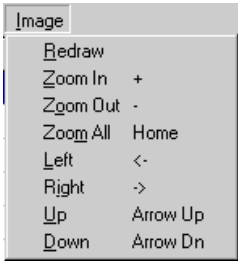
FIGURE 8-19. Template to Channel dialog



1. **Select FILE-TEMPLATE TO CHN.** The Template to Channel dialog will appear.
2. **Complete the dialog and click [OK]**.
   - **Click [Template] or [Line]** and select the file from which you want to read the template information.
   - **Click [Channel] and name your new Channel File** including the path to the directory where it will be saved.
3. **Verify the results** in the 3DView window by loading the resulting file (FILE-OPEN) and taking a look (WINDOW-3D VIEW).

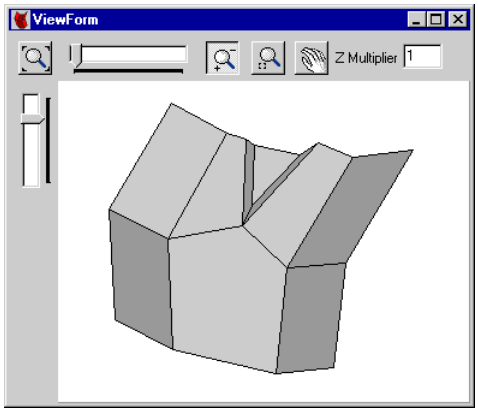
VIEWING YOUR CHANNEL IN ADVANCED CHANNEL DESIGN

In the Node and Faces Editors, use the Image menu options to adjust the view of your data on your screen.



From the ADVANCED CHANNEL DESIGN shell, select **WINDOW- 3D VIEW** and the View window will display your channel.

FIGURE 8-20. 3D View Window

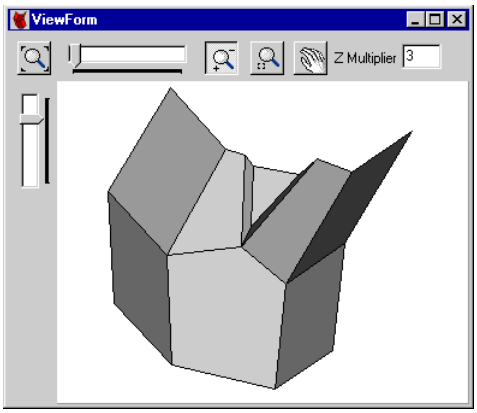


Use the slides to set the perspective from which you view your design. The top slide rotates the design around centered, vertical axis. A left-hand slide rotates the design around a centered, horizontal axis.

You can adjust the zoom scale and positioning of your display using the **Zoom** and **Pan** buttons .

If the contours of your channel are difficult to see, you can accentuate the depth changes by increasing the **Z Multiplier** and clicking the **Redraw** button .

FIGURE 8-21. *3D View with Z Axis Multiplied*



SAVING SCREEN CAPTURES OF YOUR CHANNEL

Each window in ADVANCED CHANNEL DESIGN includes two icons that export screen captures of the graphical display.

The **Snap Shot icons** export your screen capture to a BMP format graphic file. Just click the icon and name your file.

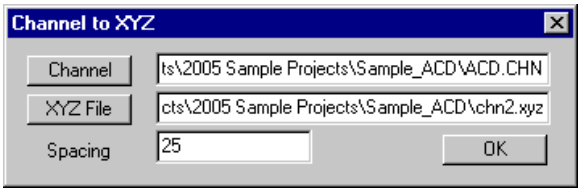
The **Print icons** print the screen capture to the default Windows printer.

EXPORTING XYZ FILES BASED ON YOUR CHANNEL FILE (*CHN)

ADVANCED CHANNEL DESIGN can extract positions at user-specified intervals along the margins of each face in your Channel File and export them to an XYZ file.

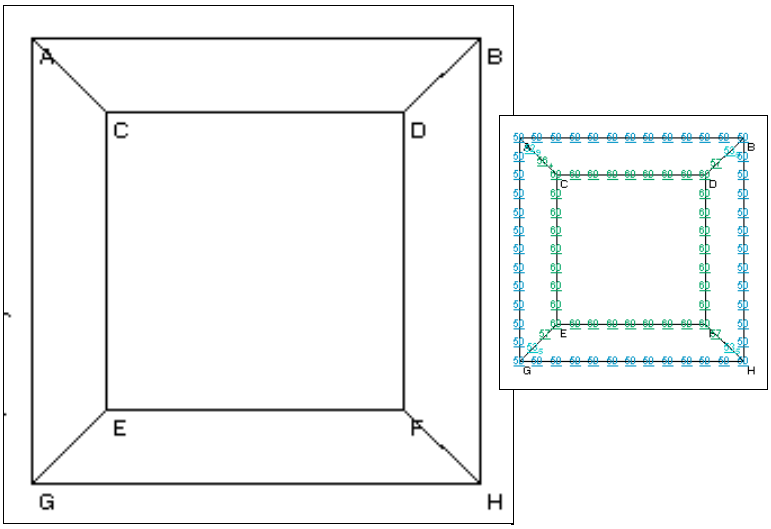
1. **Select FILE-CHN TO XYZ** and the Channel to XYZ dialog will appear.

FIGURE 8-22. *Channel to XYZ dialog*



2. **Click [Channel] and select the CHN file** from which you want to create your XYZ file.
3. **Click [XYZ File] and name your output file**.
4. **Set the point spacing (in survey units) and click [OK]**. ADVANCED CHANNEL DESIGN will place points at the requested interval along the outlines of the faces. The resulting file will be saved to a file with the name and location indicated.

FIGURE 8-23. *Original CHN File (left), XYZ Overlaid on the CHN (right)*



EXAMPLES IN ADVANCED CHANNEL DESIGN

CREATING A CHANNEL AND ADDING TOES IN ADVANCED CHANNEL DESIGN

Example:

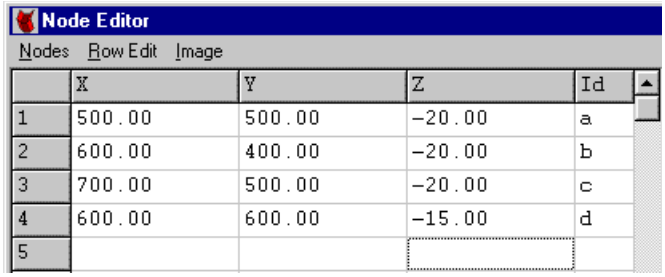
1. **Create a simple rectangular face** with the coordinates listed below.
2. **Check your faces and correct any errors**.
3. **Add Toe lines.** On the side defined by nodes "A" to "D" the slope is 1:2 and top depth is 0. On the side defined by nodes "C" to "B" the slope is 1:2 and top depth is 0.
4. **Save your file** to DEMO.CHN.

X	Y	Z	A
500	500	-20	A
600	400	-20	B
700	600	-20	C
600	600	-15	D

Solution:

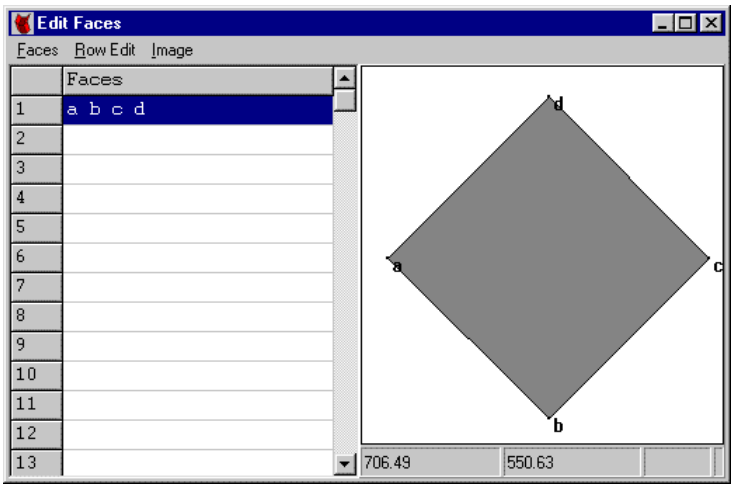
1. **Open the ADVANCED CHANNEL DESIGN program** by selecting UTILTIES-ADVANCED CHANNEL DESIGN. The ADVANCED CHANNEL DESIGN shell will appear.
2. **Create the rectangular area**.
   a. **Enter your Node data.** Open the NODE DIALOG by clicking WINDOW-NODES, and enter the data points as listed above. Select FILE-SAVE to save the data to temporary memory. Select FILE-EXIT to return to the CHANNEL EDITOR.

FIGURE 8-24. *Nodes Defined*



   b. **Define your faces.** Open the FACES DIALOG by selecting WINDOW-FACES, and entering the nodes in counter-clockwise order. You may manually type them into the spreadsheet (with a space between each number) or hold Shift while using your mouse to click, in sequence, on the nodes that define each face.

FIGURE 8-25. *The defined faces draw to the right side of the Edit Faces dialog*



   c. **Save your faces** to temporary memory by selecting FILE-SAVE.
   d. **Check your faces** by selecting FACES-CHECK FACES. A text file will appear that will say "Face No. 1 Non Flat Face Error 5". This means that the points defining the face are not all in the same plane and the distance they are off plane from each other is 5 survey units (feet or meters).

e. **Correct the error** by returning to the node editor and changing the Z-value for node "D" to –20. After saving the nodes and rechecking the faces, the text file should read "Face No.1 O.K.".

f. **Return to the CHANNEL EDITOR** by selecting FILE-EXIT.

3. **Add the Toes**.

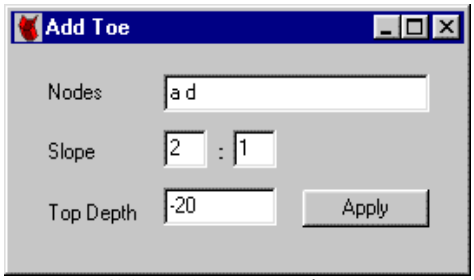
a. **Select FACES-ADD TOES**. The Add Toe dialog will appear.

b. **Enter the nodes describing the side of the face to which you want to add the toe**. Remember, if you pretend you are looking from the first node to the second, the toe will be constructed to the left.

c. **Enter the slope of the toe.**

d. **Enter the depth at the top of bank**.

FIGURE 8-26. *Adding Toes*



e. **Click [Apply].** The program will calculate the size and position of the toe, and create and name the outer nodes.

f. **Repeat the process for the second toe**.

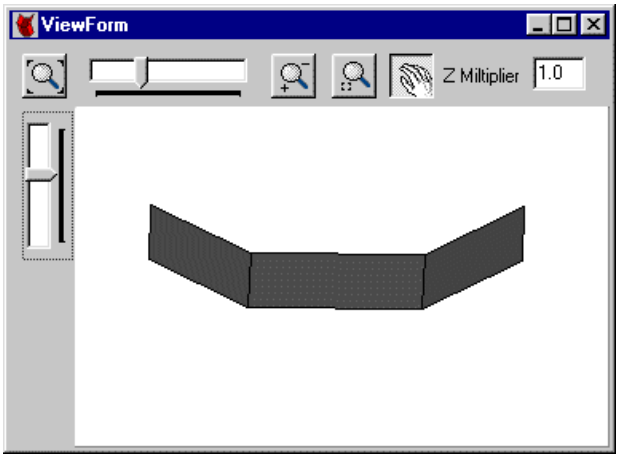
4. **Save your faces** by selecting FACES-SAVE.

5. **Return to the ADVANCED CHANNEL** DESIGN **shell** by selecting FACES-EXIT.

6. **Save the Channel File** by selecting FILE-SAVE and naming it "Demo". It will be saved to your project directory with a CHN extension.

You can preview the channel in three dimensions by selecting WINDOW-3D VIEW.

FIGURE 8-27. *Previewing The Channel in 3D View*



CREATING A DIGGING FILE FROM A BORDER FILE

Often our DREDGEPACK® users know the perimeter and depth of their digging area, and they need to generate a channel file with a side slope of user-defined, horizontal-to-vertical ratio.

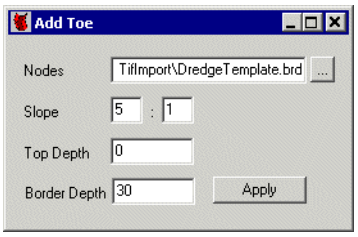
Instead of manually entering individual nodes in the Nodes dialog, you can import a border file to the Faces dialog in ADVANCED CHANNEL DESIGN to define the bottom face of your channel template.

1. **In the BORDER EDITOR, create a border file** to define the perimeter of the bottom face (bottom-of-slope) in the digging area.
2. **Open ADVANCED CHANNEL DESIGN**.
3. **Load the Border file**.
   a. Open the Faces dialog and select FACES-ADD TOES.
   b. Click [...] and select your border file. The program imports the vertices of the border file as nodes, numbers them and saves them to the node list.
4. **Enter the side slope ratio**.

TIP: If you enter the border nodes in the *clockwise* direction when you build the border file, a positive slope makes the toes rise outward from the border file edge.

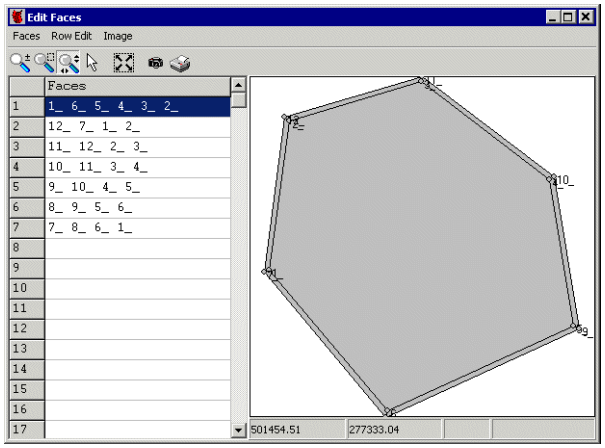
5. **Enter the finished depth** of your digging area under Border Depth.

FIGURE 8-28. Importing a Border File to ADVANCED CHANNEL DESIGN



6. **Click [Apply].** The program calculates additional nodes for the top of bank, then joins the nodes into faces.
7. If you plan to use this channel template for volume calculations, **select FILE-CHECK FACES** and examine the report for non-convex faces and proper face orientation.

FIGURE 8-29. Faces resulting from the imported border



8. **Visually check your result (optional)** in the 3D View (WINDOW-3D VIEW).
9. **Save your channel file.** Select FILE-SAVE and name your CHN file.

CREATING A CHANNEL DESIGN USING A PLANNED LINE FILE

Example :

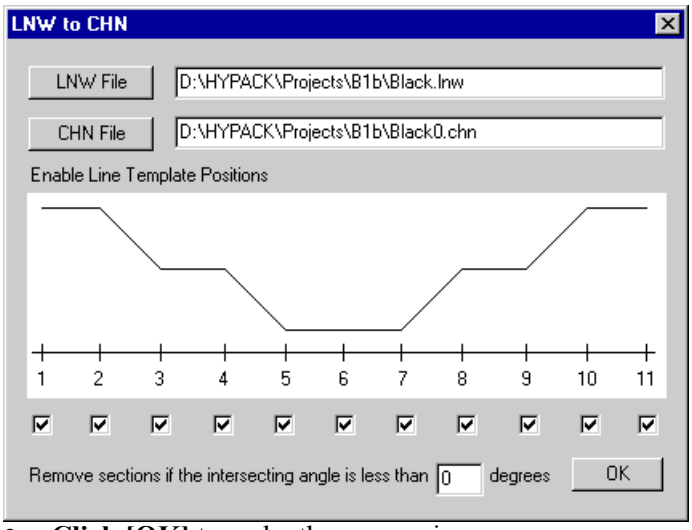
Create a Channel File for use in the TIN Model program using the Black Planned Line File in the B1B project as the source of your channel information. Create it with all of the survey lines included and name it Black0.chn. Create a second Channel File omitting lines with an intersect angle of less than 1 degree and name it Black1.chn.

Solution:

1. **Open the B1B project** by selecting FILE-OPEN PROJECT and selecting B1B.
2. **Open the ADVANCED CHANNEL DESIGN program** by selecting UTILITIES-ADVANCED CHANNEL DESIGN.

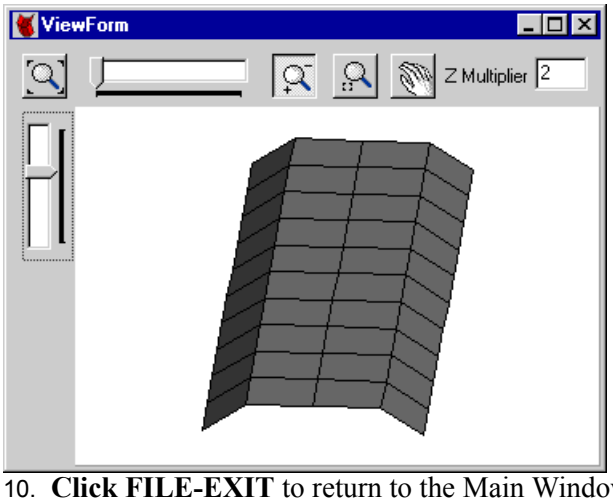
3. **Select FILE-LNW TO CHN**. The LNW TO CHN dialog will appear.
4. **Select your Line File.** Click on [LNW File] and select the Black.lnw file in the B1B directory from the File Selection Dialog.
5. **Name your Channel File:** Type in the path and name your file Black0.chn.

FIGURE 8-30. *The LNW to CHN Dialog*



6. **Click [OK]** to make the conversion.
7. **View your Channel File** (optional).
8. **Load the Black0.chn file** by selecting FILE-OPEN and choosing it from the File Selection dialog.
9. **Select WINDOW-3D VIEW** and your Channel File will be drawn to the screen.

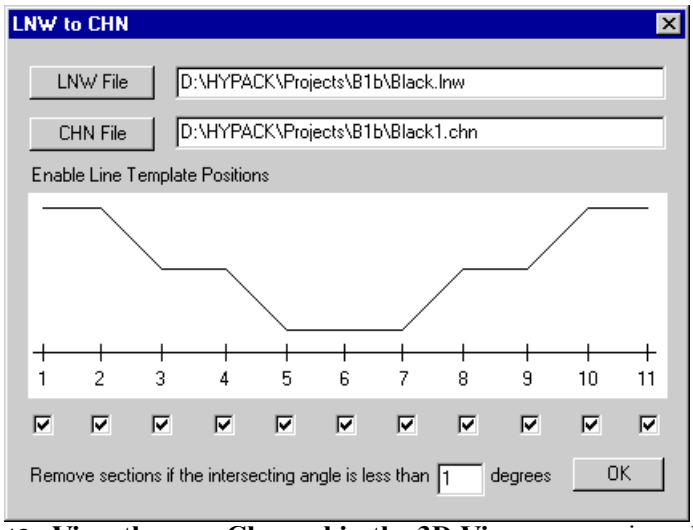
FIGURE 8-31. *The resulting Black0.CHN File drawn in 3D View*



10. **Click FILE-EXIT** to return to the Main Window.

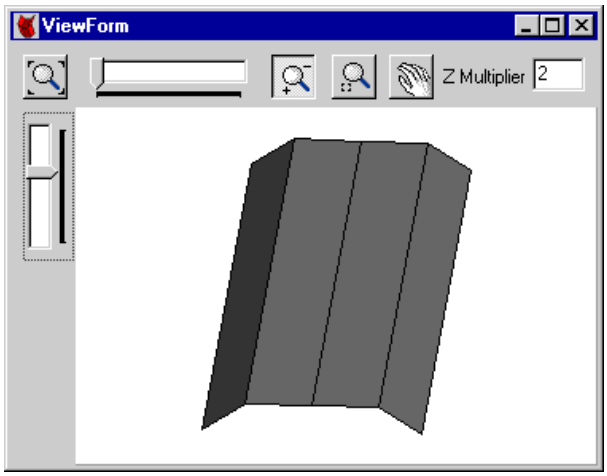
11. **Reopen the LNW to CHN dialog.** Change the CHN File Name to Black1.CHN and the angle value to "1" and click [OK].

FIGURE 8-32. *Setting the Intersect Angle in the LNW to CHN Dialog*

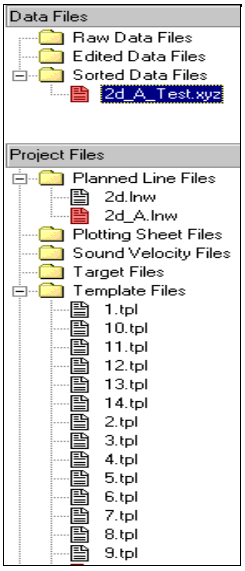


12. **View the new Channel in the 3D View** as you viewed Black0.chn.

FIGURE 8-33. *Previewing the new channel.*



INTERSECTOR PROGRAM

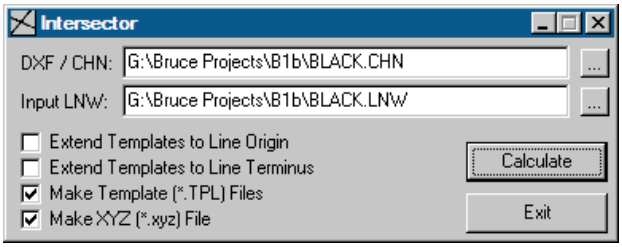


INTERSECTOR coordinates the data from a channel file (*.CHN) or a 3-dimensional DXF channel plan (in polylines only) and a 2-dimensional planned line file (*.LNW) of the same area. It calculates the channel depth at each point where the planned line crosses a polyline in a DXF file or at the edge of a face in a channel file. From this information, it can:

- **Generate 3-dimensional planned lines** with template information derived from the channel file.
- **Generate an XYZ file** containing all points where the line file crosses a line in the DXF or in the CHN where two faces meet..
- **Generate template files** (*.TPL) where the points calculated for each survey line are used as inflection points. These templates can then be used in CROSS SECTIONS AND VOLUMES in Average End Area-No Segments volumes calculations.

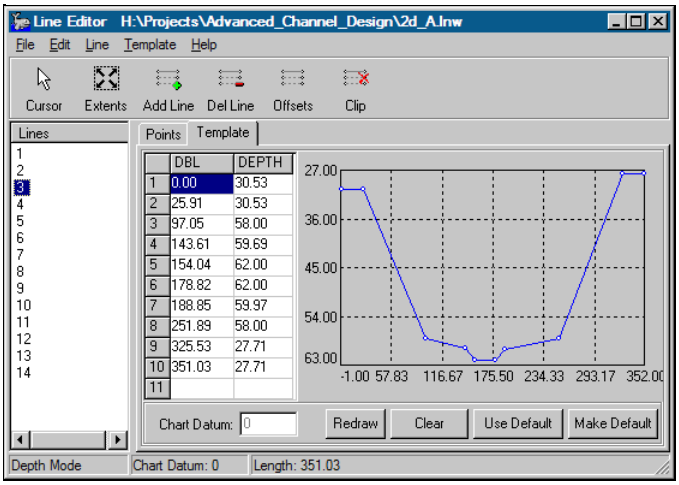
1. **Launch the INTERSECTOR** by selecting UTILITIES-DREDGING UTILITIES - INTERSECTOR. The INTERSECTOR dialog will appear.

FIGURE 8-1. *Intersector Dialog*



2. **Enter the files containing the line and channel information.** Use […] to browse for the correct files and to assure the correct path.
3. **Select your output options.**
   - **Extend Templates to Line Origin** and **Extend Templates to Line Terminus:** If your planned lines extend beyond the boundaries of your channel file, INTERSECTOR can add start and end points in the template. The XY of the points match the start and end points of the line file, and the depth equals the nearest depth calculated from the template. The template extends on each end to the start and end points of the line file.

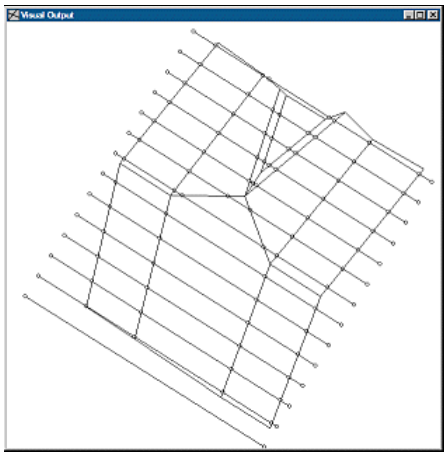
FIGURE 8-2. *Example of Extended Templates--The templates of a 3D line file can be viewed in the template tab of the LINE EDITOR.*



- **Make Template Files:** The INTERSECTOR generates a set of template files, one for each survey line, that can be used in CROSS SECTIONS AND VOLUMES to calculate volumes using the End Area-No Segments calculation method.
- **Make XYZ File:** The INTERSECTOR saves all of the calculated points to an XYZ data file.

4. **Click [Calculate].** A preview window will show your channel and line files. A small circle marks each inflection point.

FIGURE 8-3. *Preview of the Inflection Points Calculated by the INTERSECTOR*



5. **Exit the INTERSECTOR program**. Close the preview window and click [Exit].

A new, 3-dimensional line file will be created and named with the same name as the original planned line file with an '_A' appended to the root name. For example, in the above example, your input line file was 2d.lnw. The output line file would then be 2d_A.lnw. You can confirm the templates have been appended by loading the new file to the LINE EDITOR, selecting the template tab and scrolling through the lines.

FIGURE 8-4. *Viewing Templates for Each Line in the LINE EDITOR--The template in this figure has not been extended.*

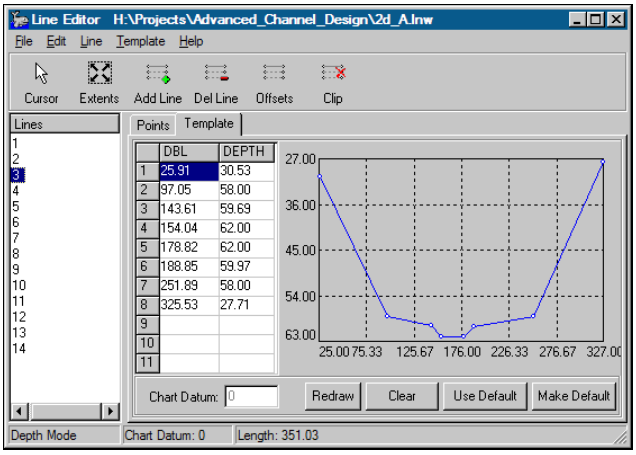
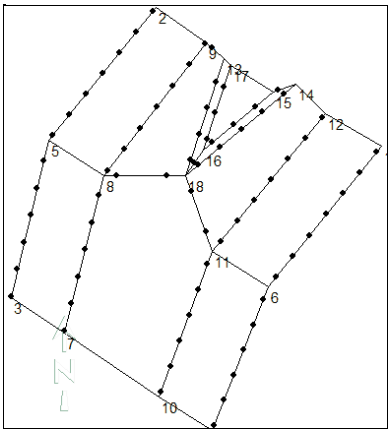


FIGURE 8-5. *Viewing the XYZ overlaid on the Channel File in HYPACK®*



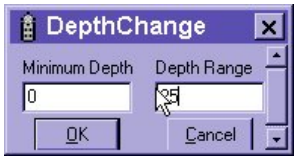
ECHOGRAM PROGRAM

The ECHOGRAM program enables you to manually digitize your echograms. This is sometimes necessary in areas with "liquid mud" or "fluff" where the digitized sounding received from the echogram is not representative of the actual bottom. Using the ECHOGRAM program and a digitizer tablet, you can digitize the depths and their relative fix positions. This information is saved in a *.DEP file. The digitized depth data can then be merged with positions in the SINGLE BEAM EDITOR, using [Merge]. The result is saved to an Edited All format file that has the correct position and depth information.

NOTE In order to run this program, you must have a Windows® digitizer driver (such as WINTAB32.DLL) installed for your digitizing table/tablet. These drivers are specific for each table/tablet and are not distributed as a part of HYPACK®.

1. **Open the ECHOGRAM program** by selecting UTILITIES-DIGITIZING-ECHOGRAM.
2. **Register your echogram** on the digitizing tablet.
   a. **Select CHART–REGISTER CHART**.
   b. **Use the 1st digitizer button to click**:
      - the top-left of your echogram scale (key-line)
      - the top right of your digitizer scale (key-line)
      - the bottom center of your digitizer scale
3. **Set the scale for your echogram** by selecting CHART–SCALE. Enter the value for the top and bottom of your echogram (where you clicked in step one).

FIGURE 8-1. *Setting your Scale*



4. **Reference your event marks**.

FIGURE 8-2. *Entering your fix numbers*

   a. Enter the value of the first event mark.
   b. Click on each individual event mark.
   c. When you're finished, click the digitizer's 2nd button.

   The screen will draw the event marks as you digitize each one.

5. **Working left-to-right, digitize the depth information**. You should click the 1st button of the digitizer tablet at each location where you want to store a depth. The program will store the relative fix location (14.25 = 25% of the distance from event 14 to event 15) in an ASCII file format. When you are finished, click the 3rd button.
6. **Indicate whether you want to shift the echogram** and continue to digitize or you want to stop and save the results to a *.DEP file. If you shift the echogram, you will need to re-register it on your digitizing tablet.

FIGURE 8-3.

More Information

- "Merging Digitized Depth Data with Raw Survey Data" on page 4-27

CONTOUR EDITOR

The CONTOUR EDITOR is used to manually modify lines in a DXF chart.

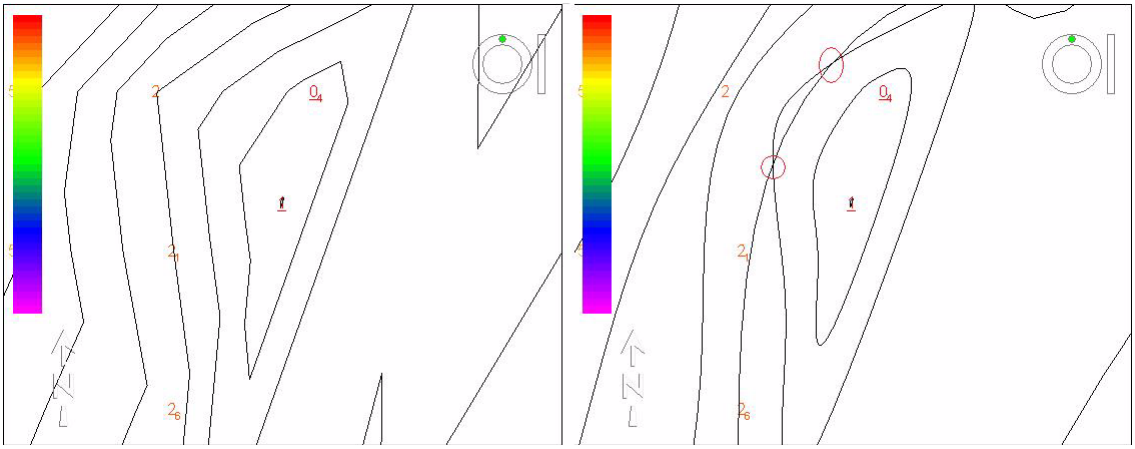
- **Reposition contour lines:** In TIN MODEL, when you export your contours to a DXF chart, the smoothing option occasionally results in crossed contour lines. The CONTOUR EDITOR enables you reposition the 'offending contour line' in approximately the correct position, if this occurs.
- **Delete waypoints**
- **Smooth contours** by adjusting each waypoint position based on the positions of two waypoints on either side of it.
- **Simplify contours** by removing waypoints positioned more closely than a user-defined threshold distance.

More Information

- "Running the CONTOUR EDITOR" on page 8-109
- "View Options in the CONTOUR EDITOR" on page 8-110

RUNNING THE CONTOUR EDITOR

FIGURE 8-1. *Contour Comparison - no smoothing (left), smoothed (right)*



1. **Launch the CONTOUR EDITOR** by selecting UTILITIES-FILE WORK-CONTOUR EDITOR.
2. **Load the problem contour file** by clicking [Open DXF File] and selecting your file from the File Open dialog.
3. **Load corresponding sounding data. (Optional)** The CONTOUR EDITOR accepts either XYZ or a catalog of All Format data. These soundings provide a guide as you work with the contours.
4. **Optimize your view** where you want to work.

5. **Display your waypoints** by clicking the Enable Grip Points icon. This icon toggles the waypoint display on and off.

6. **Modify your DXF chart as necessary**.
   - **To relocate your contours:**
     i. Click on the Move Point icon.
     ii. Click -and-drag the contour that you want to reposition.

NOTE: You may need to do this multiple times along the contour line to position it properly.

   - **To smooth your contours,** click the Line Smoothing icon.

   - **To simplify your contours:**
     i. Click the Simplify icon. A Threshold dialog will appear.

FIGURE 8-2. *Threshold Dialog*

     ii. Set the minimum distance between the points describing your contours in your simplified chart and click [OK].
   - **To delete waypoints in your contours:**
     i. Click on the Delete Waypoints icon.
     ii. Click on each waypoint you want to delete.
     iii. Exit delete mode by selecting another cursor tool.

7. **Save your DXF.** When your editing is satisfactory, click [Save DXF] and name your corrected chart. The contour chart will be saved, by default, to your project folder.

More Information

- “Exporting Contours from TIN Models” on page 7-142

VIEW OPTIONS IN THE CONTOUR EDITOR

Zoom Tools: **Zoom In/Out:** When this option is selected, a left-click decreases the scale (zoom in) and a right-click increases the scale (zoom out).

Zoom Window: Select this option and drag a rectangle in the window to define the extent of your desired view. The program will redraw the screen to display the defined area optimally.

Zoom Extents: When this option is selected the screen will be drawn at a zoom scale that displays all enabled data.

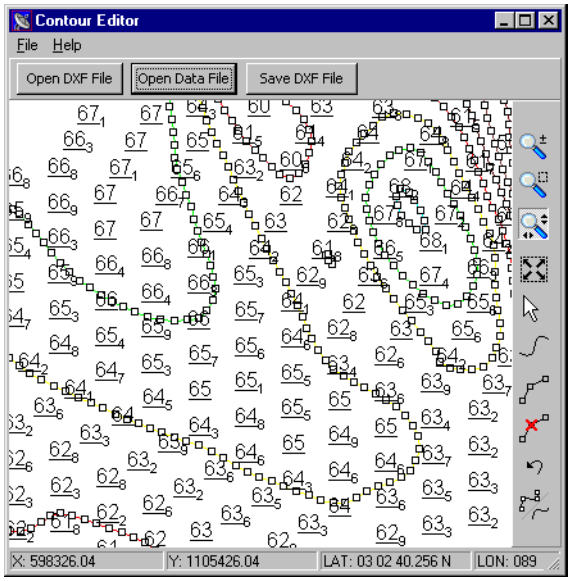
Pan: Select this option, then click in the window at the point around which the display should be centered. The display will redraw accordingly.

Sounding Overlay:

In addition, you can overlay All format sounding files of your contoured area to guide your work. You can load an individual file or a catalog file of All format files. These soundings are for display purposes only. *They will not be included when you save your edited contours to DXF.*

1. **Click [Open Data File].** A File Open dialog will appear.
2. **Select one or more sounding files and click [OK]**.

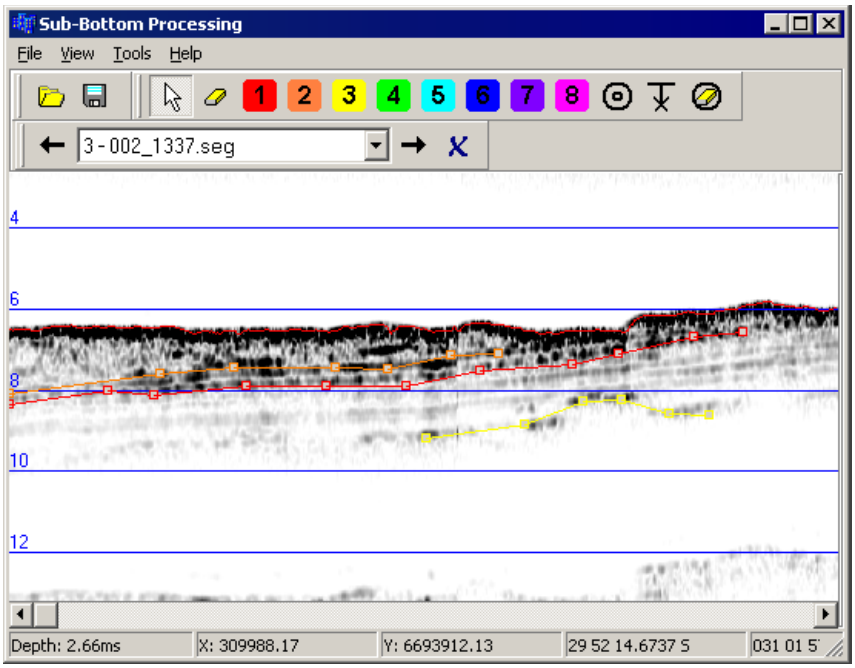
FIGURE 8-3. *Contours with Soundings Overlaid*



SUB-BOTTOM PROCESSING

The SUB-BOTTOM PROCESSOR displays SEGY sub-bottom data and provides tools with which you mark targets, and digitize your layers. The SUB-BOTTOM PROCESSOR converts the digitized points to the HYPACK® All format, which may then be displayed with the targets in the HYPACK® screen or loaded to CROSS SECTIONS AND VOLUMES where you can overlay the layers in profile view and export them to a plotter.

FIGURE 8-1. *Sample SUB-BOTTOM PROCESSOR Display vertical axis in milliseconds)*



RUNNING THE SUB-BOTTOM PROCESSOR

1. **Launch the SUB-BOTTOM PROCESSOR** by selecting UTILITIES-SUB-BOTTOM PROCESSING.
2. **Load your raw data,** setting your read parameters.
3. **If you are digitizing your sub-bottom layers, do the following:**
   a. **Set your display options and visually inspect your data**.
   b. **Mark targets** as desired.
   c. **Digitize your layers**.
4. **Save the results** by clicking the Save icon. You may save as often as you wish. Each time, files from the last save will be overwritten with updated information.

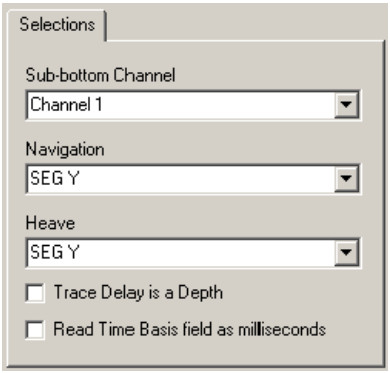
5. **Exit** the SUB-BOTTOM PROCESSOR.

LOADING YOUR DATA IN THE SUB-BOTTOM PROCESSOR

1. **Click the File Open icon and select the files to load.** The ADCP driver records a pair of data files for each line—a raw file and an SEG file. You can load an SEG file or a catalog. If the catalog contains RAW files, the program will automatically load the corresponding SEG data

   If you load a LOG file, the program displays the first file and lists it in the toolbar. You can scroll through the rest of the LOG using the left and right arrows.
2. **Select your read parameters.** Before your selected files can be read, a dialog appears for you to select:
   - **Data Sources**:
     - **Sub-bottom Channel**
     - **Navigation**
     - **Heave**
   - **Trace Delay is a Depth:** If your SEGY data is in distance rather than the usual seconds, check this option.
   - **Read Time Basis field as milliseconds:** If you SEGY time basis is in milliseconds instead of the usual seconds, check this option.

FIGURE 8-2. *Selecting your Data Sources*



3. **Click [OK].** The loading process will advance to the Sub-bottom Profiler display.

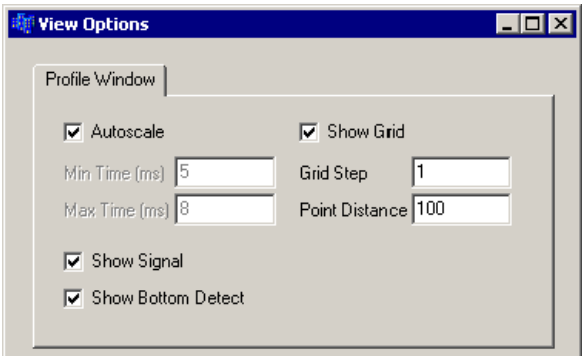
DISPLAY OPTIONS IN THE SUB-BOTTOM PROCESSOR

Use the View Options dialog to configure the graph display.

To access the View Options dialog:

Select VIEW-OPTIONS (F9).

FIGURE 8-3. *View Options Dialog - Profile Window Tab (left),*



Autoscale sets the graph to the range of your data. To manually scale the graph, clear the Autoscale option and use the **Minimum Depth** and **Maximum Depth** values to enter the range you want in seconds.

Show Grid displays horizontal lines across your graph at depth intervals determined by the **Grid Step**.

Point Distance: The most pixels between digitized marks for them to be connected. If you want to close the gap, you can mark one or more points in the space until it closes. The connecting lines are for display purposes only. They do not affect the output All files, but they help visualize the layers as they may be presented in CROSS SECTIONS AND VOLUMES with a Maximum DBL Gap specified

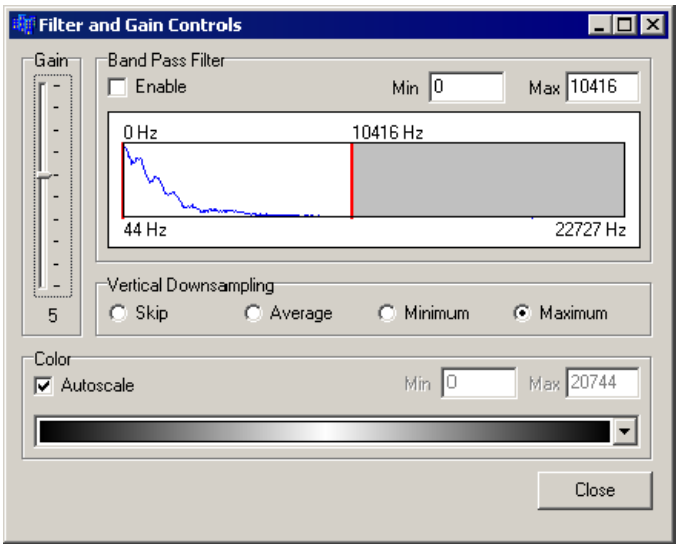
Show Signal displays the Signal Toolbar.

Show Bottom Detect displays a red line where the strength of the return indicates solid bottom.

Filter and Gain Controls:

The filter and gain controls provide flat gain, FFT band pass filtering and several color palette options.

FIGURE 8-4. Filter and Gain Controls



Gain multiplies the contrast in the drawing.

Band Pass Filter removes noise from bipolar data. Check the 'Enable' option and set the range where you will keep the data. You can enter the minimum and maximum Hz values in the fields provided or use your cursor to drag the vertical bars on the graph.

Vertical Downsampling controls how the data is downsampled for drawing on the screen. The program calculates how much data it can draw (1/n where n=(Total Points/pixels in the display)).

- **Skip**: Every 'n' point will draw in the display
- **Average**: The program will average 'n' points at a time and draw that value.
- **Minimum** or **Maximum** simply takes the least or greatest value in each 'n' points.

Color option allows you to choose a color palette suitable for your data:

- For unipolar data, negative amplitude is zeroed.
- For bipolar data, choose:
  - negative amplitude in red, positive in blue
  - rectified view (absolute value of amplitude in grayscale)

Use the **Min**. and **Max** settings to set the range of the palette or check the **Autoscale** option to let the program automatically scale the display to the data for you.

MARKING TARGETS IN THE SUB-BOTTOM PROCESSOR

As you view your data in the SUB-BOTTOM PROCESSOR, you can mark targets at points of interest. These targets will be annotated in the

SUB-BOTTOM PROCESSOR and may be displayed in other HYPACK® modules that support targets.

If there is an existing target file where you want to store your targets, you should open it in the SUB-BOTTOM PROCESSOR by selecting FILE-SELECT TARGET FILE and choosing your file. Otherwise, the program will generate a new target file and ask you to name it when you save your work in the SUB-BOTTOM PROCESSOR.

The SUB-BOTTOM PROCESSOR generates two types of targets.

- A **plain target** with X, Y, time and date information.
- A **Distance to Object target**, which also includes the distance of the object from the bottom track.

Each target is named, by default, with a date and time pair derived from the target position in the data.

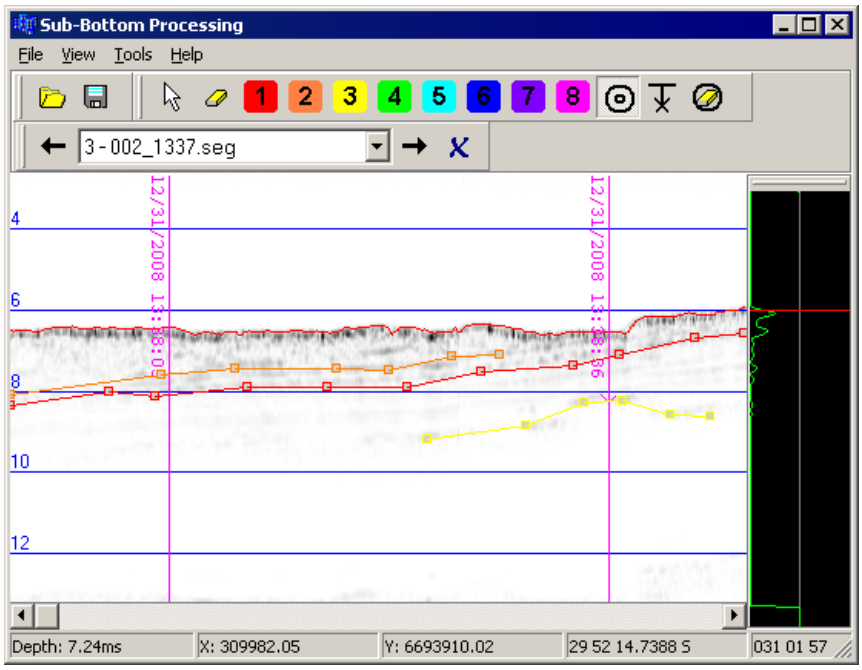
To mark a plain target:

1. **Click the Target icon**. The cursor will change to match the icon.
2. **Click the center of the cursor at the desired target location.** A vertical line marks the location of the target and a target is added to your target file.

To mark a Distance to Object target:

1. **Click the Distance to Object Icon**. The cursor will change to match the icon.
2. **Click the cursor's 'X' on the object.** A vertical line marks the location of the target with the distance to object delimited by V's and a target is added to your target file with the Distance to Object saved in the Distance column.

FIGURE 8-5. *Targets in the SUB-BOTTOM PROCESSOR*
Plain Target (left), Distance to Object Target (right)



To remove a target in the SUB-BOTTOM PROCESSOR.

1. **Click on the Target Eraser icon**.
2. **Click on the target or targets you want to remove**.
3. **When you are finished, click the Default Cursor icon**.

DIGITIZING LAYERS IN THE SUB-BOTTOM PROCESSOR

Once your data is loaded to the SUB-BOTTOM PROCESSOR, you can use the digitizing tools to mark the sub-bottom layers in the profile.

To digitize each layer:

1. **Select the digitizing tool** corresponding to the layer you want to mark.

FIGURE 8-6. *Digitizing Tools*

2. **Digitize points along the top edge of that layer,** *in order from left to right*. Use the scroll bar at the bottom, as required for each layer, until you have digitized its length.

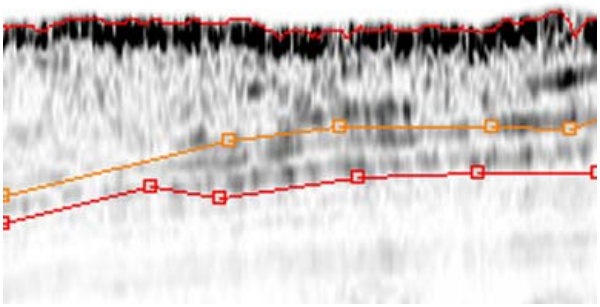
IMPORTANT: You must digitize each layer completely before you begin the next.

3. **When you are finished, click the Default Cursor icon.**

To remove a digitized point:

1. **Click on the Point Eraser icon**.
2. **Click on the target or targets you want to remove**.

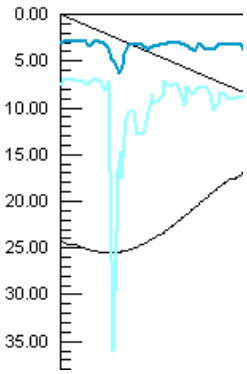
FIGURE 8-7. *Two Layers Digitized Below the Bottom Track*



When you begin to digitize each layer, an empty catalog file is created in your project's Edit folder.

Each layer of each line will be saved to your Edit folder as an All format file and named *FileName*_Layer#.EDT. This file name will also be included in the LOG file corresponding to its layer number. Thus, when you are finished digitizing all files in your raw data set, all of the sub-bottom *LineNumber*_Layer1.edt files will be in the Layer1.LOG, all *LineNumber*_Layer2.edt files in the Layer2.LOG, etc. This method arranges the files such that they are ready to load to the CROSS SECTIONS AND VOLUMES program where you can overlay them with survey data and print comparative profiles.

FIGURE 8-8. *Short Segment – 2 Digitized Layers Overlaid on Survey Data*



ADCP IN SITU

ADCP IN SITU analyzes data collected by a stationary Acoustic Doppler instrument. This type of project would monitor current, tide, salinity and pressure at a set destination over an extended period of time.

ADCP IN SITUreads data logged by Teledyne-RDI, Sontek and Nortek (NDP or Aquapro) devices using their firmware. It then presents your data in a variety of displays where you can inspect and edit your data. The resulting edited files are saved with an EDD in HYPACK® the ADOP\Edit subfolder in your project.

In addition, you may also export to the following formats:

- **Tide** data in HYPACK® *.TDX format or *.TDF format according to your choice of interface detection method.
- **Etude** (*.b)
- **User-configurable ASCII text** (*.TXT)
- **OceanDataView spreadsheet format** (*.ODV)

NOTE: This module has been developed, by contract, for our users in France. Some features will require further development for our other users.

RUNNING ADCP IN SITU

1. **Access the program** by selecting UTILITIES-ADCP-ADCP IN SITU. The program shell will appear. It is designed for you to work from left to right.

FIGURE 8-1. *ADCP IN SITU Shell*

2. **Check your file information.** (Optional).
3. **Set your Display Options**.
4. **Identify the surface**—the surface for upward facing devices and the bottom for downward facing devices.
5. **Export the interface to a TDX file.** This file should be automatically loaded to the Station tab in the Setup dialog.
6. **Set the 'Display Surface Based on' option to 'Tide'**.
7. **Remove all data that is invalid based on the detected surface**.
8. **Visually inspect your data.** ADCP IN SITU offers several displays:
   - **The spreadsheet dialog** displays data pertaining to each condition monitored by the acoustic doppler.

- **Display graph of each data set** (Optional.) Each tab in the spreadsheet has a right-click menu which includes one or more options to display a graph of the data in the selected tab.
- **Profile views** of your data are displayed in two synchronized displays:
  - **A 'binned' display of all ensembles in the current section for a specified measurement type**. Choose Velocity, Correlation, Amplitude or Pct Good measurements from the drop-down menus in the toolbar. Further display options are configured in its Setup dialog.

9. **Only one ensemble from the binned profile in a line graph, but one or more measurements at a time.** The ensemble and measurement type shown in this line graph is determined by the cursor position in the binned profle.
10. **Apply Filters.** (Optional)
    - Filter Beams from the Profile
    - Filter records from the spreadsheet data
11. **Edit your data.** ADCP IN SITU enables you to delete selected data from your spreadsheets and their corresponding graph displays as well as from the profile window.
12. **Save your edited data set**.
13. **Export Reports**.

More Information

- "Identifying the Surface" on page 8-135
- "Profile Display Options in ADCP IN SITU" on page 8-134
- "Editing ADCP IN SITU Data" on page 8-136
- "Exporting ADCP Data from ADCP IN SITU" on page 8-141

WINDOWS IN ADCP IN SITU

There are several graphical and textual displays of ADCP data:

Access file information, spreadsheets and profile displays using icons from the tool bar on the ADCP IN SITU Shell.

Additional graphs and tables are available through icons on the Profile window and through the right-click menu in the spreadsheets.

ADCP IN SITU PROFILE AND RELATED GRAPHS

To access the Profile window, click the Profile icon.

The Profile shows all ensembles in the current section for a specified data type. Choose Velocity, Correlation, Amplitude or

Percent Good and its corresponding measurement from the drop-down menus in the toolbar. This double entry function is used to select the items displayed. A principal value can be displayed with various components.

- **Velocity**: The speed of the current in mm per second.
  - **East**: West-East component, positive to the East.
  - **North**: South-North component, positive to the North.
  - **Vertical**: vertical component, positive upward.
  - **Error**:
    - **For Teledyne-RDI** current meters, the 4 transducers measure the vertical speed twice. The difference between the two measurements determines the error.
    - **For Nortek** current meters, the instrument supplies information concerning the measurement's standard deviation, which defines this Error parameter.
  - **Magnitude**: Norm of the current vector calculated from the East and North components.
  - **Direction**: gives the direction of the current.
- **Correlation**: A value specific to RDI equipment. This is determined during the processing of the signal and gives an indication of the quality of the data. The values are coded from 0 to 255 in "count". According to the manufacturer, data with a value of less than 90 can be considered as incorrect. In practice, values under 110 are disregarded.
  - **Beam 1, 2, 3 or 4**: Values specific to the various beams.

    NOTE: Teledyne-RDI current meters have 4 beams, whereas Nortek current meters have 3.

  - **Average**: Average of the beams.
- **Amplitude**: The level of the back-scattered signal throughout the range of the instrument (back-scattered echo). The values are coded from 0 to 255 in "count". This is an arbitrary scale used by the manufacturers (Nortek and RDI) to represent the dB level recorded on receipt.

  The "back-scattered echo" parameter has a peak, which is more or less marked, on each interface. This interface can be either the "air-sea" interface or the "sea-bottom" interface. This variable can be used to detect the bottom, when the instrument is pointing downwards, or to detect the surface, when it is pointing upwards.

  This display is used to determine the distance between the instrument and the interface from these diffused back-scattered echo data throughout the range of the instrument, when this interface is located within range.
  - **Beam 1, 2, 3 or 4**: Display of the various beams.
  - **Average**: Average of the beams.

- **Pct Good**: A value specific to RDI current meters. These parameters relate to the quality of the measurements.
  - **PG1**: Percentage of data with 3 valid beams during the integration period.
  - **PG2**: Percentage of measurements rejected due to too large an error during the integration period.
  - **PG3**: Percentage of data with less than 3 valid beams during the integration period.
  - **PG4**: Percentage of data with 4 valid beams during the integration period.

Display Surface Based on: During processing, the interface must be detected in order to invalidate the data beyond this interface. (In the majority of cases it is the surface because the current meter is positioned on the bottom.)

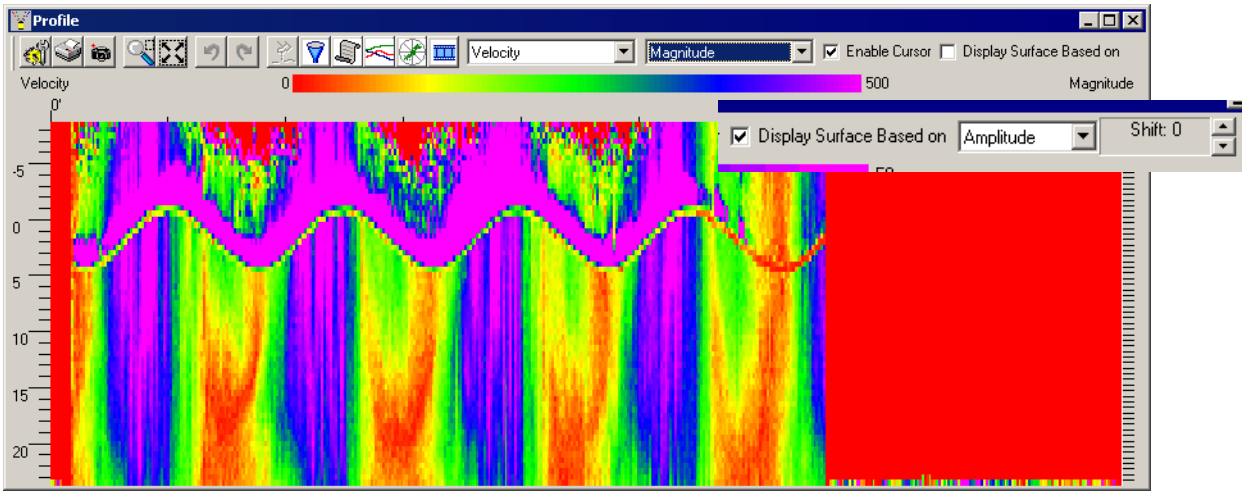
Check the 'Display Surface Based On' option and select the detection method from the drop-down list:

- **Pressure:** Use the pressure sensor.
- **Tide:** Use a tide file.
- **Amplitude:** Use the back-scattered echo. With this option, you should also set the Bump Threshold in the Profile Settings dialog.

  The **Bump Threshold** is the detection return threshold of the backscatter data.
- **Bottom track:** Bottom echo (downward facing).

Once the distance between the instrument and the interface has been detected, it is then possible to position the data by cell with respect to this interface. The up and down arrows can be used to manually refine the interface detection.

FIGURE 8-2. *All ensembles in the Current Section*

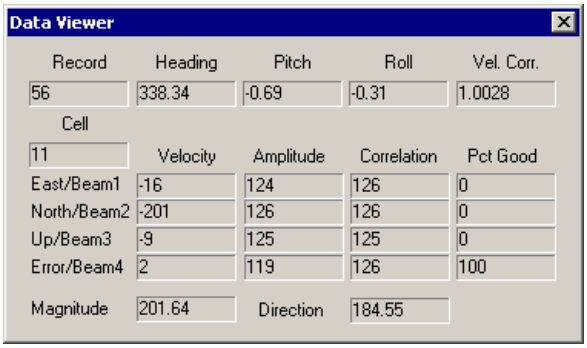


Additional, displays enable you to view select portions of the data in other ways. The data displayed is determined by the cursor position in the Profile window.

TIP: Check 'Enable Cursor' in the Profile window to display the current cursor location and the corresponding profile and beam.

- The **Data Viewer** is a concise display of the data in the beam and ensemble at the cursor location. If the data has been deleted in processing, a red 'Deleted' indicator will also appear in the dialog.

FIGURE 8-3. *Sample Data Viewer*

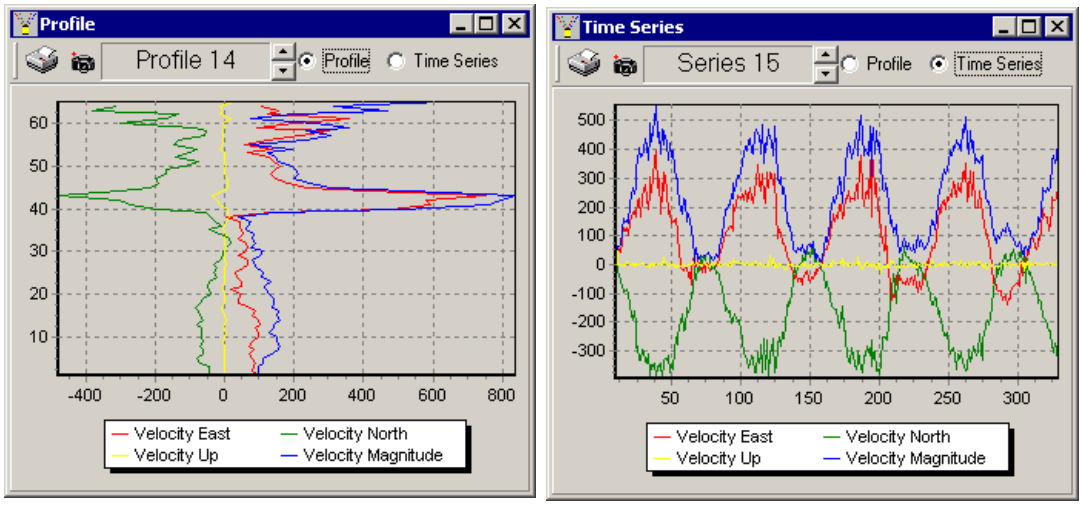


To access the Data Viewer, click the Data icon in the Profile window.

- **Graphs using Descartes and Polar coordinate systems.** Each graph can display data from one ensemble at a time (profile view) or from an individual beam over time (time series view).

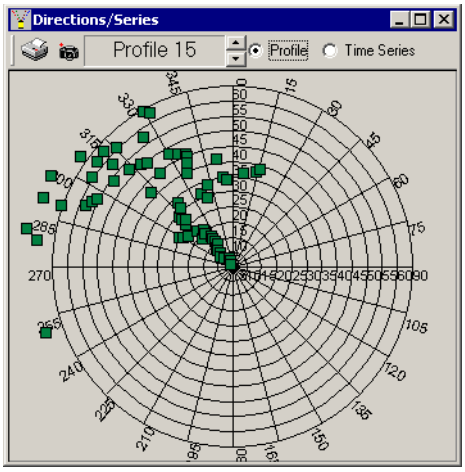
  To view this data in a simple line graph (Descartes coordinates),click the Profile icon on the Profile window tool bar .

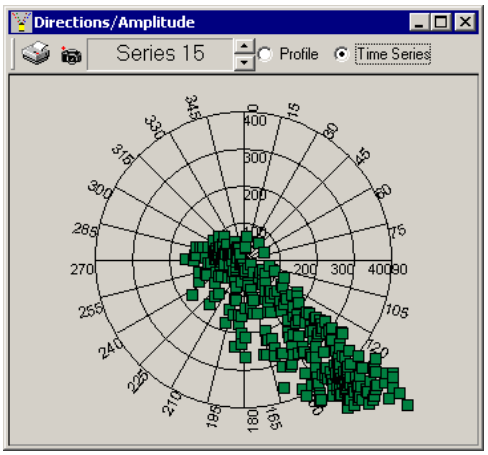
FIGURE 8-4. *Descartes Graph in Profile View (left) and Time Series View (right)*



To view this data in a graph using polar coordinates,click the Directions icon on the Profile window tool bar .

FIGURE 8-5. Graph in Polar Coordinates - Profile View (left) and Time Series View (right)





Choosing the graphed measurements:

To choose each measurement to be graphed, right-click in the window and check the desired measurement. You can remove a measurement from the graph by removing the check in the same manner.

Adjusting your graph view:

To adjust your view in any of these graphs, you can do any of the following:

TABLE 8-1. Zoom Tools

View Adjustment	Cursor Action
Zoom window	Click and drag a box from its top left to its bottom right corner
Zoom Extents	Click and drag a box from bottom right to upper left
Shift the display in the window	Right-click in the display and drag it in any direction.

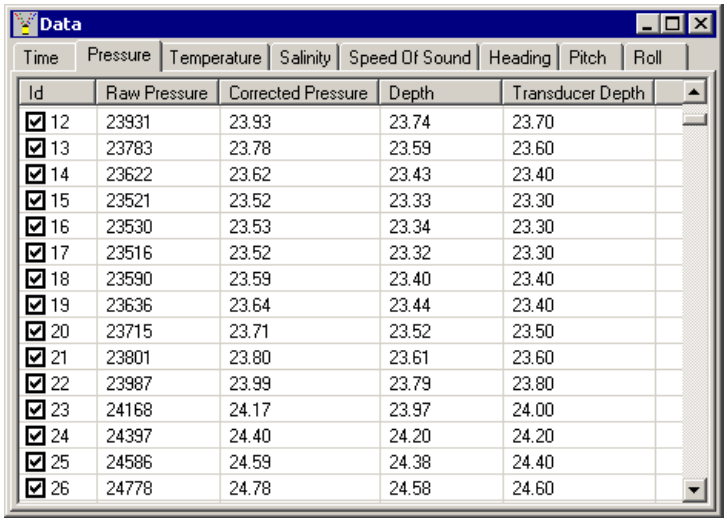
ADCP IN SITU SPREADSHEETS AND THEIR GRAPHS

More Information

- “Profile Display Options in ADCP IN SITU” on page 8-134

To access the spreadsheet window, click the Data Tables icon on the ADCP IN SITU shell.

FIGURE 8-6. *Sample Spreadsheets*



A tabbed dialog contains spreadsheets of data pertaining to each condition monitored by the acoustic doppler. Each spreadsheet shows the raw data, as well as the data corrected according to the Calibration settings.

Each tab in the Spreadsheet, except the Time tab, has a right-click menu which includes one or more graph options for the data in the selected tab.Select the value you want in graph view.

TABLE 8-2. *Content of ADCP IN SITU Spreadsheets and Graphs*

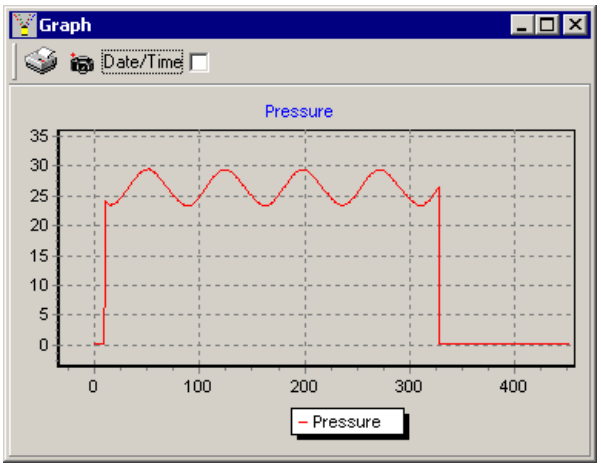
Value	Processing	Graphs
Time	• Correction of clock drift (drift noted when raising the instrument between the equipment's time and the GPS time – the correction is applied linearly across all values) • Correction of time zone. • Dating in the middle of the integration period (depending on the instrument, the default dating is at the start or end of the measurement integration period. This processing is used to apply a date in the middle of the integration period). • Manual editing.	None.
Pressure	• Calibration correction. • Calculation of the actual depth of the instrument by integrating the pressure data. The depth is calculated in metres using the UNESCO formula. • Manual editing with graphic display.	Pressure Depths
Temperature	• Calibration correction. • Manual editing with graphic display:	Temperature

Value	Processing	Graphs
Salinity	None	Pressure Depths
Speed of sound	• Correction of the speed of sound, the value of the speed of sound is calculated by means of the Del Grosso formula using the previously processed pressure, salinity and temperature data. • Correction of the current module. • Correction of the position of the measurements with respect to the instrument.	Pressure Depths
Attitude	Correction of the direction of the current	Pressure Depths

In any of these graphs, you can:

- Save a BMP image of the current display.
- Print the current display on your current default printer.
- Graph the data against the recording number or against date and time
- Delete select points.

FIGURE 8-7. *Sample Graph*



Adjusting your view

You can adjust your viewof the graph with your mouse.

To zoom in to a specific area, drag a rectangle around the area.

To adjust the scale of the display, use your mouse wheel to zoom in and out.

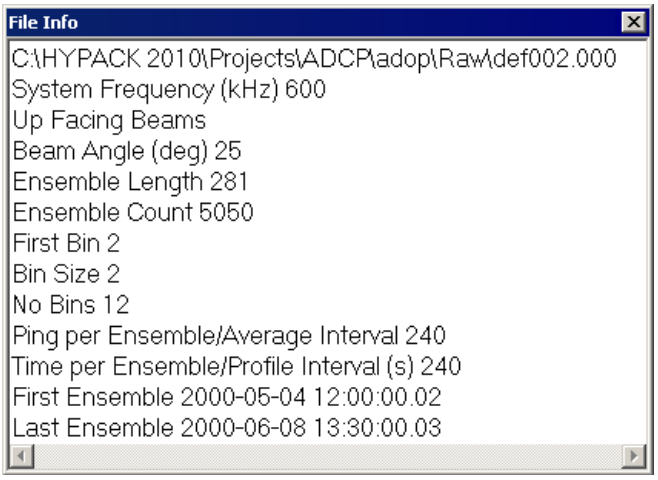
To zoom to the extents of the data, drag from the lower-left to upper-right corner of the display.

FILE INFORMATION

The File Information displays statistics about the current raw file.

To access the File Information, click the File Info icon.

FIGURE 8-8. *Sample File Information Display*



ADCP IN SITU SETTINGS

Access the setup options from the Setup icon in the ADCP IN SITU shell. They instruct the program how to read and display the data, enabling you to configure the program for your acoustic doppler data and your project.

This dialog has several tabs, each affecting a different aspect of the configuration. *Before you load your data,* set the options in each tab and click [OK].

To save these options for later use, click the Export Out icon on the ADCP IN SITU tool bar and name your file. The settings are saved, by default to the project ADOP folder with an INI extension.

To reload an existing configuration file:

1. **Click the Open File icon** on the toolbar in the ADCP IN SITU shell. A File Open dialog will appear.
2. **Set the File of Type to 'Config'**.
3. **Select your exported initialization file** and click [Open].

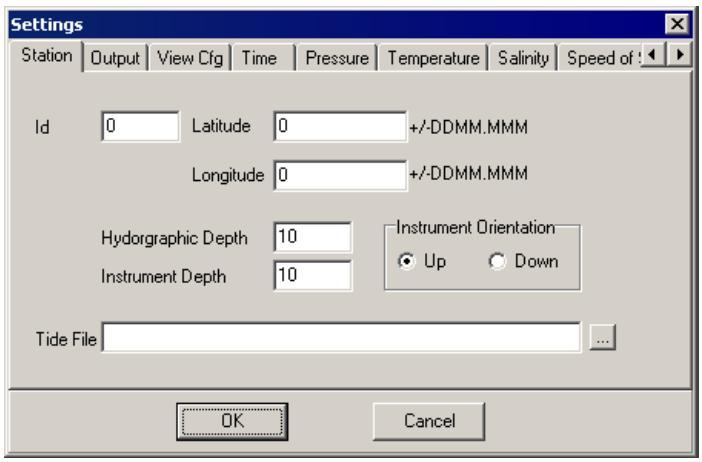
More Information

- "Exporting Files in ADCP IN SITU" on page 8-141

STATION OPTIONS IN ADCP IN SITU

The station options describe the acoustic doppler device.

FIGURE 8-9. *Station Options*



ID: The acoustic doppler device serial number.

Lat/Lon.: Location of the acoustic doppler in DDDMM.MM format.

Hydrographic Depth: Also known in HYPACK® as the Corrected Depth, this is the distance from the water surface to the bottom (MSL).

Instrument Depth/Submersion: Distance from the water surface to the acoustic doppler (MSL). It is the *Hydrographic Depth- Device Offset.*

NOTE: This option is either 'Depth' or 'Submersion'according to the Intrument Orientation.

Instrument Orientation: Is the device pointing upward or downward.

Tide file: Select the HYPACK® tide file (*.TDX) or Masg (*.TDF). It is used to calculate the hydrographic and instrument depths. This is required if you want to calculate your currents referencing the water surface.

OUTPUT SETTINGS AND VIEW CONFIGURATION DISPLAY IN ADCP IN SITU

The Output options describe how to read the device output. The View Configuration (View Cfg) tab provides a graphical representation of the settings in the Output tab. Use this display to verify your settings.

Current Calculation options:

- **To reference Mean Sea Level (MSL)** check the '**Measure at Hydrographic Depth**' option.
- **To reference the water level**, do not check the '**Measure at Hydrographic Depth**' option. In this case, *you must specify a tide file* in the Station tab.

Measurement Distance Start and End sets the range of distance from the device where the data is measureable. These options eliminate the area near the surface that is not measureable due to blanking and near the bottom that is not measureable due to interference from the side lobe interference. These measurements reference MSL or the water surface according to the 'Measure at Hydrographic Depth' status.

FIGURE 8-10. *Referencing the Surface - Output Tab (left), View Cfg Tab (right)*

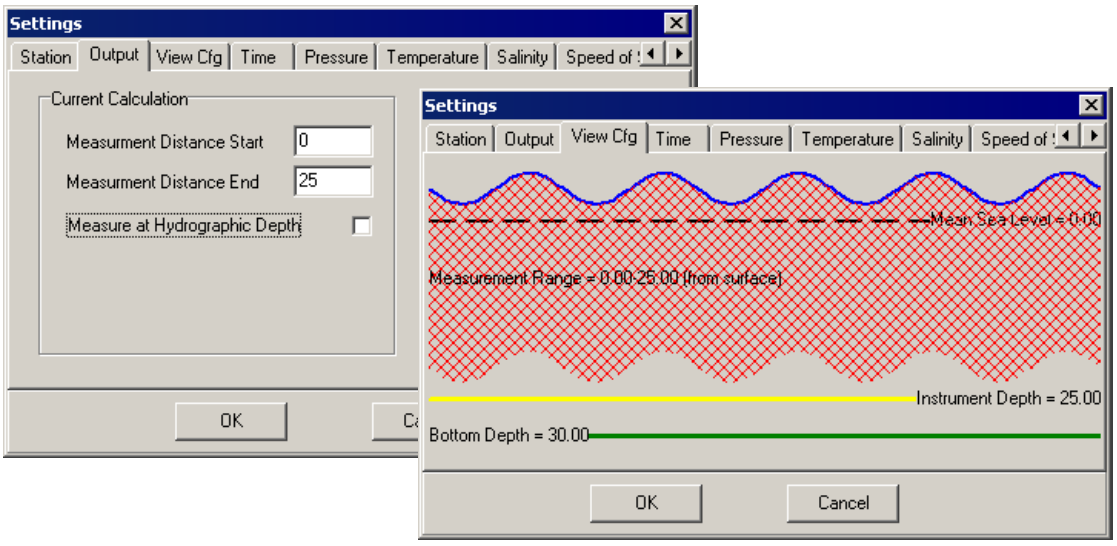
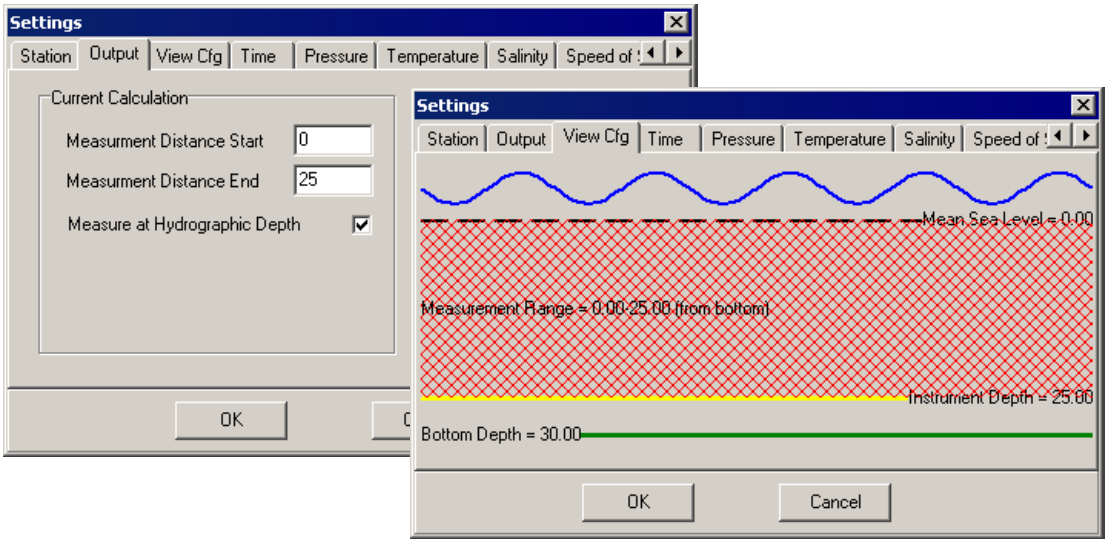


FIGURE 8-11. *Referencing MSL--Output Tab (left), View Cfg Tab (right)*



Bottom/Surface Detection Methods

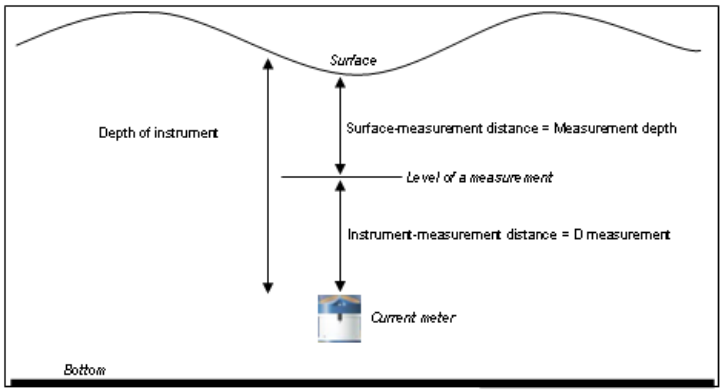
During processing, the interface must be detected in order to invalidate the data after this interface. These options tell the program what type of data will be available in your data to detect a surface, either the water surface, when the device is oriented up, or the bottom, when it is oriented down.

- **Pressure:** In the data file (data produced by the current meter) the measurements are positioned in meters from the instrument. The depth of the measurements with respect to the surface is calculated using the following information:
  - Depth of the pressure sensor ($I_{instrument}$);
  - Orientation of the instrument (upwards or downwards);
  - Distance of the measurement with respect to the instrument ($D_{measurement}$).

  The depth is calculated in meters as follows:

  Measurement depth = $I_{instrument} - D_{measurement}$

FIGURE 8-12. *Detecting the Surface Based on Pressure*



NOTE: Pressure calculations also require the latitude of your project area and the air pressure at sea level. If you are using pressure readings to calculate your surface, enter this information in the Pressure tab

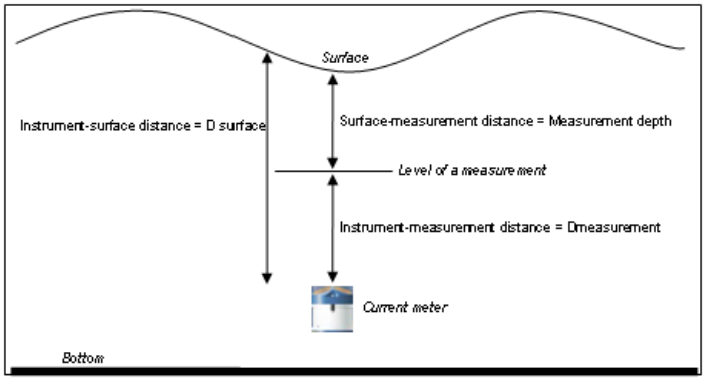
- **Bottom Data**
- **Amplitude**: This method determines the distance between the instrument and the interface based on the data from the back-scattered echoes scattered throughout the length of the range of the instrument, when this interface is within the range of the instrument. ADCP IN SITU recognizes a significant shift in amplitude as an indication of surface detection. This option also enables the **Bump Threshold** which determines how much of a shift is significant for your project.

  The depth of each measurement from the surface is calculated based on the following elements:
  - Distance between the surface and the instrument ($D_{surface}$), calculated using the back-scattered echo.
  - Distance of the measurement with respect to the instrument ($D_{measurement}$).

  The depth is calculated in meters as follows:

$$\text{Measurement depth} = D_{surface} - D_{measurement} \quad \textbf{(EQ 1)}$$

FIGURE 8-13. *Detecting the Surface Based on Amplitude*



- **Tide:** The pressure sensor is not present on all instruments and a failure of this sensor can occur. The depth of each measurement can be calculated from a tide file. This tide can be predicted or measured by a tide gauge. The following elements are used:
  - Predicted or observed tide (H_{tide}):Height of water as a function of time;
  - Hydrographic Depth (H_{datum}): Height of water with respect to the hydrographic datum in the zone. This corresponds to the depth at the mooring point.
  - Orientation of the instrument (upwards or downwards);
  - Instrument Depth ($H_{instrument}$) Height of the instrument with respect to the bottom.
  - Distance of the measurement from the instrument ($D_{measurement}$).

  The depth is calculated in meters as follows:

$$\text{Measurement depth} = H_{tide} + H_{datum} - H_{instrument} - D_{measurement} * (\text{orientation sign}) \quad \textbf{(EQ 2)}$$

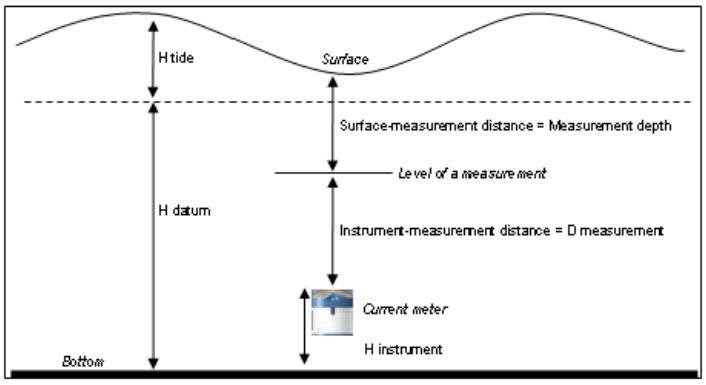
  Where:

  (orientation sign) = "+", if instrument is facing upwards

  (orientation sign) = "-", if instrument is facing downwards

  You must set the correct time zone of the tide used by entering a Time Zone Shift in the Time tab. The time zone defaults to UTC time).

FIGURE 8-14. *Detecting the Surface Based on Tide*



- **None**

Once the distance between the instrument and the interface has been detected, you can position the data by cell with respect to this interface using the shift up and down arrows.

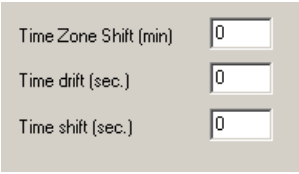
The View Configuration is a graphical representation of the settings in the Output tab.

More Information

- "ADCP Data - Measured and Calculated" on page 10-122

TIME SETTINGS IN ADCP IN SITU

FIGURE 8-15. *Time*



Time Zone Shift: The difference (in minutes) between Greenwich Mean Time (GMT) and your Local Time. This converts the acoustic doppler data to local time in your edited files.

Time Drift: Check the time from the device at the start and at the end of data collection and compare the times to a reliable time source. Enter the number of seconds the ADCP device clock has drifted from GMT over the time during which you were logging data. The drift is positive if the equipment's clock time increments more quickly than the actual time. The drift correction is applied linearly across the entire period.

Time Shift: Any additional shift (in seconds). It will be added to the Time Zone Shift. ADCP IN SITU automaticaaly makes this correction for Nortek Aquapro and RDI data.

CALIBRATION SETTINGS IN ADCP IN SITU

For each type of data you will read, you must provide ADCP IN SITU with any additional information it will need to accurately interpret your data and make the appropriate calculations. The Setup dialog includes one tab for each data type for this purpose.

In most cases, the tab includes only a couple of calibration constants with which you can adjust your data if necessary.

Beware!

BEWARE! Often the setup in the device itself includes these calibration constants. *Enter them in only one place!* If you enter them in the device, the data files will be corrected in the device and should not be adjusted again in HYPACK®; this would result in a double-correction.

The corrected values are calculated with the following equation where M is the measured value:

Corrected Value = *a0* + (**M** x *a1*) **(EQ 3)**

The default values (a0 = 0 and a1 = 1) result in no data adjustments will be calculated.

NOTE: Currently supported devices do not have salinity or speed of sound sensors. Therefore, the calibration constants generally are not used and remain at the default values.
Salinity is user-defined in the Nortek configuration software and used with the temperature measurement to calculate speed of sound. The salinity calibration constantscan be used to approximately correct an error in the programmed salinity value. (It is not *exactly* a calibration correction.)
If the data files contain no salinity, enter the correct valuein the a0 field.

In addition to the calibration settings, additional information is required if you are determining your surface using pressure or speed of sound measurements and to account for the attitude of the acoustic doppler device.

FIGURE 8-16. *Temperature and Salinity*

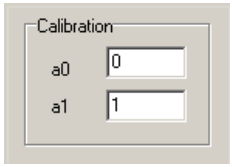


FIGURE 8-17. *Speed of Sound*

FIGURE 8-18. *Pressure*

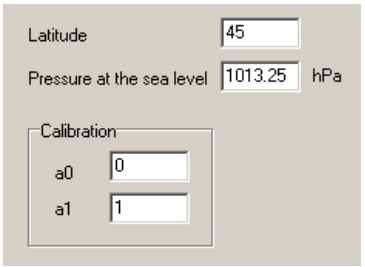
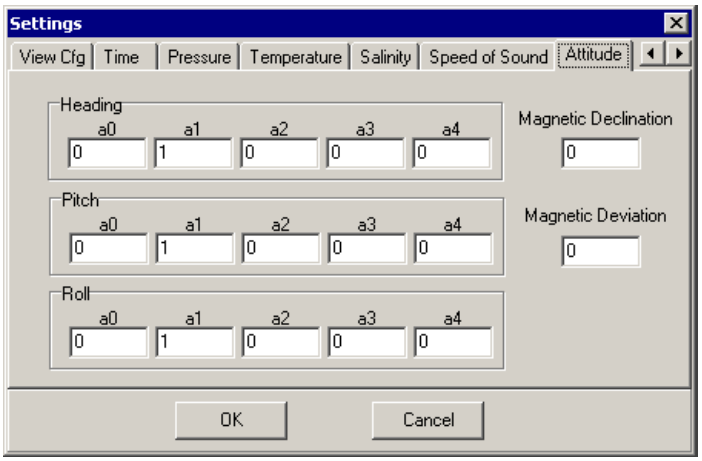


FIGURE 8-19. *Attitude*



- **Pressure** calculations also require the **latitude** of your project area and the air **pressure at sea level**. If you are using pressure readings to calculate your surface, enter this information in the Pressure tab.
- **Speed of Sound:** The **Disable Del Grosso Correction** option allows you not to apply the speed of sound correction and, thus, to use a speed of sound fixed at 1500 m/s for all values.
- **Attitude** calculations require magnetic declination and deviation values. In addition, the calibration calculations are more complex because it is a three-dimensional calculation. Heading, Pitch and Roll are calculated by the following equation where M is the measured value:

$$\textbf{Corrected Value} = A0+(M+A1)+(M^2+A2)+(M^3+A3)+(M^4+A4)+(M^5+A5) \quad \textbf{(EQ 4)}$$

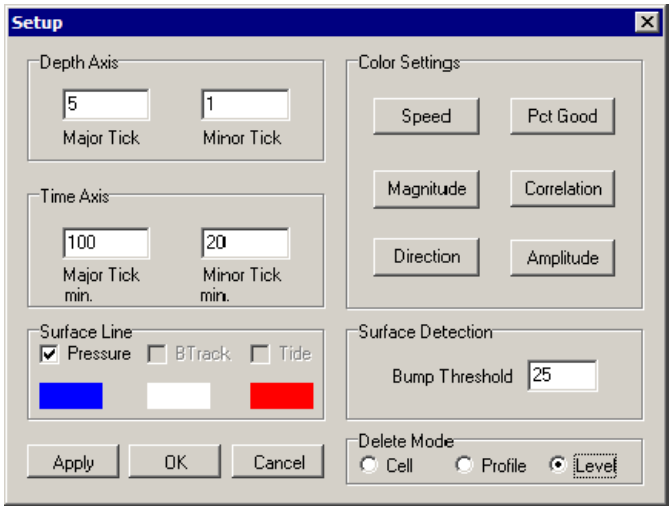
Magnetic Declination: The angle between the local magnetic field—the direction the north end of a compass points—and true north. The declination is positive when the magnetic north is east of true north.

Magnetic Deviation: The error induced in a compass by local magnetic fields, which must be allowed for, along with magnetic declination, if accurate bearings are to be calculated.

PROFILE DISPLAY OPTIONS IN ADCP IN SITU

The display options for the Profile window are in the ‘Setup’ window. Click the Setup icon in the Profile window.

FIGURE 8-20. *Binned Profile Display Options*



Time Axis and **Depth Axis** options: Set the label increments for the X and Y axes respectively.

Color Settings: Set the color schemes to represent each of the supported values--Speed (Velocity), Percent Good, Magnitude, Correlation, Direction, Amplitude. Click the button corresponding to the value you want to configure and configure the colors from the standard HYPACK® Colors dialog. When you close the Colors dialog, the current color settings are automatically stored to a Colors file (*.HCF) in the \ProjectName\ADOP folder. Each HCF file is named according to the value it represents (usually the button label). For example, click [Amplitude] and configure colors to display the amplitude values. The HCF file will be named amplitude.hcf. These color file may be loaded by clicking a button under 'Color Settings' and selecting the corresponding HCF file.

Surface Line displays the tide or pressure curves on the profile window during surface detection.

The **Bump Threshold** is the detection return threshold of the backscatter data.

Delete Mode enables you to delete one bin (cell), one ensemble (profile) or one beam (level) in the Profile window.

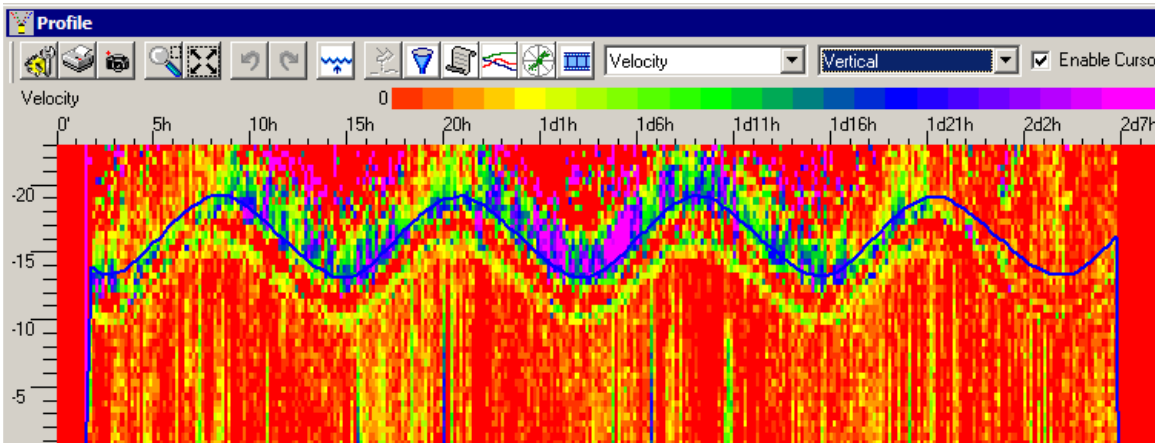
IDENTIFYING THE SURFACE

The first step in processing your data is to identify the surface—the water surface for upward facing devices and the bottom for downward facing devices. The surface must be detected in order to invalidate the data after this interface.

1. **Set the Surface Line option**, in the Profile Settings dialog, to display the tide or pressure curves on the Profile window.

2. **Set the detection method with the 'Display Surface Based On' option** on the Profile window tool bar.
   - **Sensor on the bottom:** This is the most common usage. In this case, the sensor is facing upward and the interface is the surface. You will use any of the following detection methods:
     - **pressure** sensor
     - **tide** file
     - **amplitude** of back-scattered echo: In this case, set the **bump threshold** in the Profile Setup dialog.
   - **Sensor on the surface:** In this case, you will use bottom tracking of the echosounder and tide data
3. **View the data relative to the surface line**.

FIGURE 8-21. *Surface Line Guides Accurate Surface Detection*



4. **Manually shift the displayed data** (Optional.) Use the up and down arrows on the tool bar, cell-by-cell to obtain the best match with your surface line.
5. **Save the Surface Line data in the format of a tide work (*.TDX) file** using the Export Tides icon. It will be saved, by default, to your *ProjectName*\ADCP folder. It will also be automatically loaded to the Station tab in the ADCP IN SITU Setup dialog.

NOTE: This fileis not a tide correction file; the TDX format is simply one in which HYPACK® can store this type of data.

EDITING ADCP IN SITU DATA

When you load your data in ADCP IN SITU, the data is read according to the setup options set from the ADCP IN SITU shell. ADCP IN SITU presents your data in a variety of displays where you can inspect and further edit your data.

When you have finished your editing session, save the results by clicking the ‘Save’ icon. The resulting edited files are saved with an EDD in HYPACK® the ADOP\Edit subfolder in your project.

NOTE: The HYPACK® EDD format is very similar to the RDI format and can be read by the RDI readers if you rename the file with a ‘000’ extension.

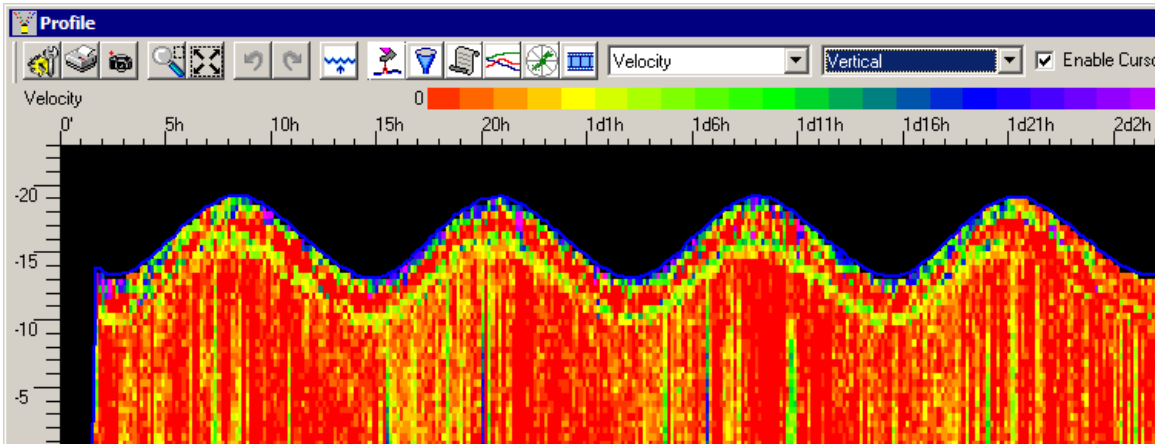
REMOVING DATA BEYOND THE DETECTED SURFACE

Once you have detected the water or bottom surface, the first step to edit your data is to remove all data beyond the detected surface.

When you saved the Surface Line information to the TDX file, it was automatically loaded in the Station tab of the ADCP IN SITU Setup dialog. Regardless of the method used originally to detect the surface, you can now remove invalid data based on the surface line ‘tide’ file.

1. In the Profile window, **set the ‘Display Surface Based on’ option to ‘Tide’**.
2. **Click the (foot) filter icon**.

FIGURE 8-22. *Surface Line Guides Accurate Surface Detection and Removal of Invalid Data*



More Information

- “Identifying the Surface” on page 8-135

EDITING WITH FILTER SETTINGS IN ADCP IN SITU

The filters in ADCP IN SITU provide additional filters that remove additional data that falls outside user-defined ranges. The spreadsheets and the Profile windoweach have their own set of filters according to the data they display.

To access the filter options:

- In the Profile window, click the filter icon
- Right-click in the spreadsheet and select 'Filter'.

To apply a filter:

1. **Select the tab and check the 'Enable' option for each filter you want to apply**.
2. **Set the filter parameters**. The **Minimal and Maximal Values** define the range of data.
   - **Filters for the values in the spreadsheets** remove records whose values fall outside the user-defined range.
   - The **Magnitude and Range filters** delete all data that falls within that range.
   - **Direction filter:**
     - **If the 'Inside' option is checked**, the filter deletes all data that falls within that range.
     - **If the 'Inside' option is clear,** it deletes all data that falls *outside* of the defined range.
3. **When all of the parameters are set for the enabled filters, click [OK].**

FIGURE 8-23. *Filtering by Magnitude (left) and Range of Records (right)*

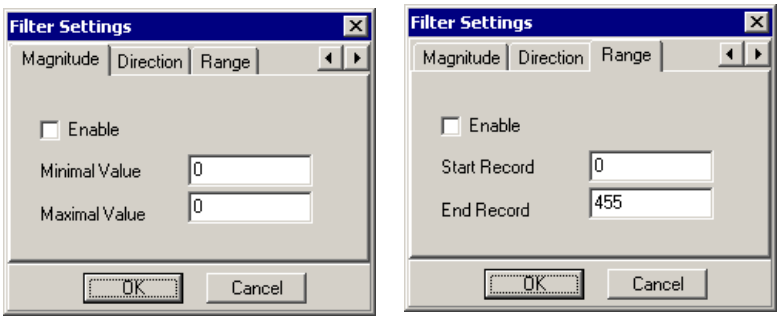
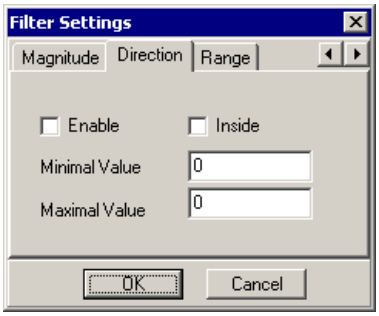


FIGURE 8-24. *Filtering by Direction*



EDITING IN THE PROFILE VIEW IN ADCP IN SITU

In the profile view, you can manually delete one bin, an entire ensemble, or the data from one beam.

1. **In the Profile window display settings, select your delete option**.
   - **Cell**: Delete only the bin at the cursor location.
   - **Profile**: Delete the entire ensemble--the bin at the cursor location and all bins directly above and below it.
   - **Level**: Delete all data from that beam--the bin at the cursor location and all bins directly right and left of it.
2. **In the Profile window, check the 'Display Cursor' option**. (Optional) This shows the cursor in cross-hairs that highlight the ensemble and beam in which the bin at the current cursor position resides.
3. **Click on the bin or in the ensemble or beam level that you want to delete and press the Delete key.** One or more bins will be erased according to the selected delete option and you will see a white stripe where the data has been removed.

EDITING IN THE SPREADSHEETS AND THEIR GRAPHS IN ADCP IN SITU

Each tab in the spreadsheet has a right-click menu which includes one or more options to display a graph of the data in the selected tab. Editing in these windows includes deleting (and optionally restoring) select data to your display.

As you edit data in the graphical windows, the corresponding speadsheet data automatically updates.

NOTE: If you edit data in the spreadsheets, *you must manually update the graphical displays* by right-clicking in the spreadsheet and selecting 'Refresh Graph'.

Deleting and restoring individual records:

In the spreadsheets, each line begins with a check box. Clear the checks to exclude records from processing and check the box to restore them. You can do this one record at a time or multiselect records.

Deleting and restoring ranges of records:

1. **Multiselect a range of records in either the spreadsheet or the graph** display.
   - **In the spreadsheet,** hold the Ctrl key and select multiple individual records or hold the Shift key and click on the first and last records in a range of consecutive records.
   - **In the graph**, hold the Ctrl key while you click and drag a window around the data.

Selected records appear highlighted in the spreadsheet and appear as yellow markers in the graph.

2. **Press Delete**. This toggles the check box status. (If it was checked it will be cleared, if it was clear, it will be checked.)

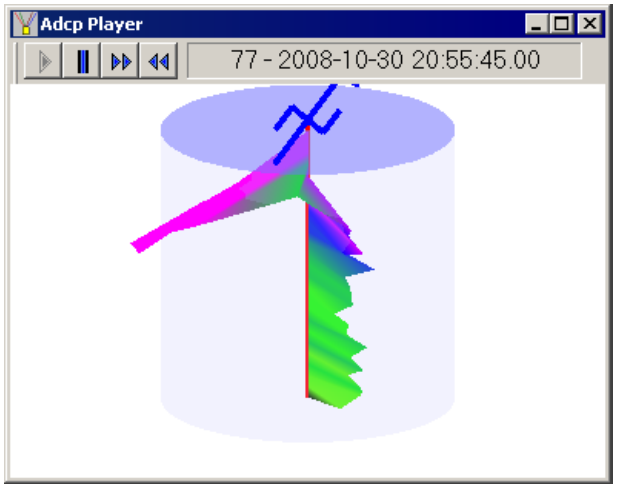
Validating multiple lines:

1. **Multiselect a range of records.**
2. **Press Escape.** The boxes for all selected records will be checked.

ADCP PLAYER

The ADCP Player is an animated display of the magnitude values as a function of time.

FIGURE 8-25. *Sample ADCP Player Display*



To access the ADCP Player, click the Player icon.

NOTE: It is preferable to activate this view from the Velocity/ Magnitude representation of the Profile window in order to display it with the corresponding color palette.

Use the player controls to replay the data magnitude records. They are, from left to right, Play, Pause/ Resume, Faster, Slower.

To adjust the display, use the following keyboard or mouse controls:

TABLE 8-3. *Zoom and Orientation Tools*

Function	Keyboard	Mouse
Zoom in/out	+/-	Scroll wheel
Increase/Decrease Magnitude Scale	Page Up/Page Down	
Change Angle of Horizontal Display	Up/Down Arrows	Shift key + Scroll wheel
Change Axis of rotation	Left/Right Arrows	CTRL key + Scroll wheel
Return to first recording	Esc	

EXPORTING ADCP DATA FROM ADCP IN SITU

SAVING SCREEN CAPTURES IN ADCP IN SITU

You can store bitmap images or print hard copies of the displays in most ADCP IN SITU windows.

To save a digital image: Just click the Bitmap icon in the window you want to capture and name your file. The image will be saved, by default to your project folder.

To print a graph: To print the contents of a graph, click the Print icon in window. The image will be printed on your default printer.

NOTE: Set your printer preferences before entering ADCP IN SITU.

EXPORTING FILES IN ADCP IN SITU

You can export one or more of a few select file types.

- Tide Corrections in TDX or TDF format
- Etude files
- ASCII format of user-defined data
- ODV: a specifically formatted text report
- Equipment Configuration file (*.ini)

Exporting Tide Data from ADCP IN SITU

Tide data contains the date, time, correction information.

- **A HYPACK® Tide (*.TDX) file** is used to repopulate the spreadsheet if you want to reload it in MANUAL TIDES.
- **A *.TDF file** is a specialized tide corrections format used in France.

To export a tide file:

1. **Select either the Amplitude or Pressure surface detection method** under 'Display Surface Based on' on the Profile window tool bar.
   - **Using Amplitude** (back-scattered echo), the tide file will take into account the interface detection after using the Bump detection to generate the tide file.
   - **Using Pressure**, the tide file will take into account the pressure values and any manual or graphic invalidations carried out to generate the tide file.
2. **Click the Export Tide icon in the tool bar on the Profile window**. The Export Tide dialog will appear.

3. **Select the TDX or TDF File Type**, **name your file and click [Save].** Your selected file will be saved, by default, to your project folder.

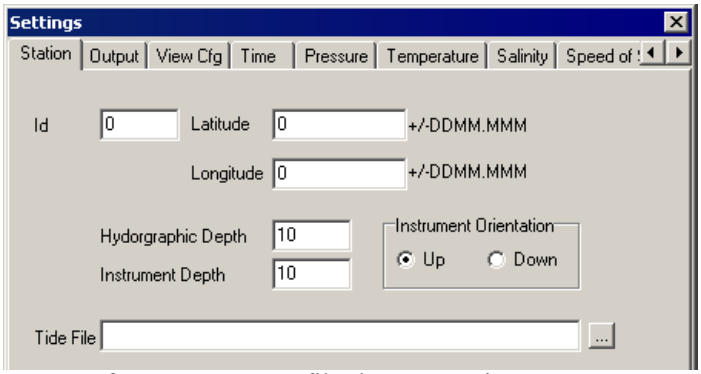
Exporting Etudes from ADCP IN SITU

Etude: Exporting in Etude format uses the data averaging algorithm between two depths as defined in the Output tab in the ADCP IN SITU Settings dialog.

IMPORTANT! The water layer that you wish to export must be a modulo of the size of the cell parametered on acquiring the equipment.

1. **Enter a tide corrections file** on the Station tab in the ADCP IN SITU Settings dialog.

FIGURE 8-26. *Station tab in the ADCP IN SITU Settings dialog*



TIP: If a TDX or TDF file does not exist, you can export a tide file from ADCP IN SITU based on the bottom tracking or pressure sensor.

2. **Click the Export Out icon in the tool bar on the shell**. The Export Data dialog will appear.

3. **Select the Current (Etude) File Type**.
4. **Name your file and click [Save].** Your selected file will be saved with a B extension, by default, to the \Hypack_2011*ProjectName*\ADCP folder.

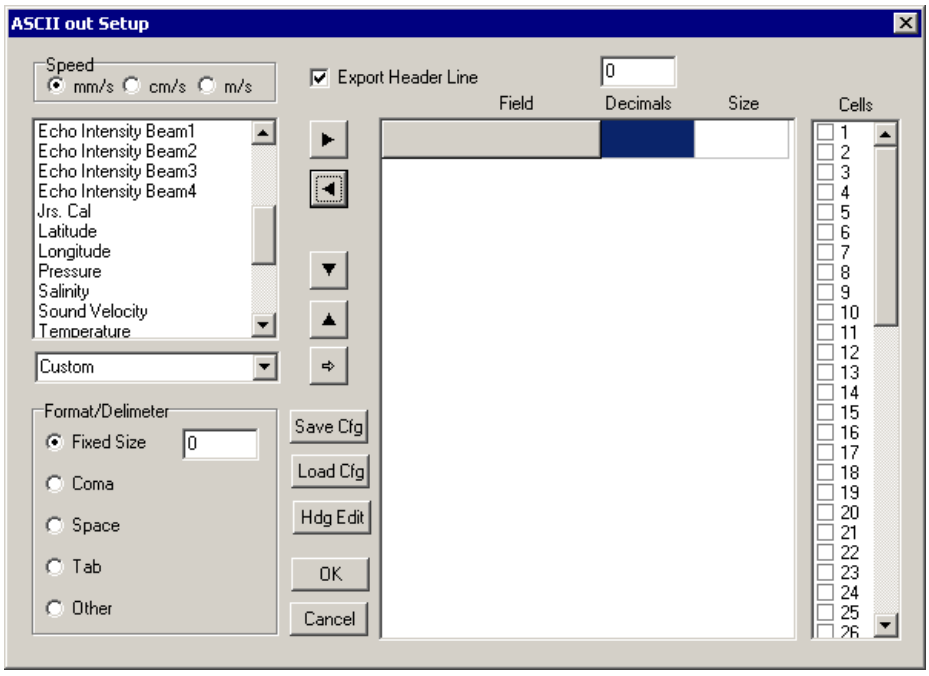
EXPORTING DATA IN ASCII FORMAT

The ASCII text file content is user-configured *after* you name your file.

1. **Click the Export Out icon in the tool bar on the shell**. The Export Data dialog will appear.

2. **Select the ASCII (*TXT) File Type**, **name your file and click [Save].** The ASCII Out dialog will appear.

FIGURE 8-27. *ASCII Output Setup*



3. **Configure the content.** For each item you want to export, do the following:
   - **Speed:** Units for the speed values in your exported file. If the data set contains speed in a different unit of measurement, the speeds will be converted during the export process.
   - **Export Header Line:** Includes labels for each column of exported data.

NOTE: If you include headers, remember to configure your column widths to allow enough characters for the header text. Use **[Hdg Edit]** to modify the header text if necessary.

   - **Fields:** Select the field in either the available or selected item list and use the arrow buttons to move them from one list to the other, or to reorder them in the list of selected items. Set the number of decimal places and column width (Size) for each selected item.

- **Delimiter:** Choose a comma, space, tab or define another character to separate each value in the line. Alternatively, you can set the column widths using the 'Fixed Size' option. A Fixed Size of zero enables you to set the width for each column individually in the selected items list. Otherwise, the size of each field is a constant, user-defined number of characters.
- **Cells:** If you have selected the 'Cell No.' item, select the cell numbers from which you want to export the selected data. Buttons above the cell list enable you to select/deselect all cells at once.

4. **Save your configuration (Optional). [SaveCfg]** Saves your Export Text settings to an initialization file (*.INI). The file will be saved with an INI extension, by default, to your project ADCP folder.
   At a later time, you can use **[LoadCfg]** to reload the same settings with just a few easy clicks.

   NOTE: If you are generating an ODV file, you can automatically configure the report by loading the ODV.ini found in the \Hypack_2011\ADCP folder.

5. **Click [OK].** Your selected file will be saved with a TXT extension, by default, to your \Hypack_2011*ProjectName*\ADCP folder.

EXPORTING AN ODV TEXT FILE

An ODV file is an ASCII text file with a particular configuration.

1. **Click the Export Out icon in the tool bar on the shell**. The Export Data dialog will appear.

2. **Select the ASCII (*TXT) File Type**, **name your file and click [Save].** The ASCII Out dialog will appear.
3. **Load the odv configuration file.** Click [Load Cfg] and select the odv.ini file from the \Hypack_2011\ADCP folder. This automatically enters the export settings required to generate a properly formatted ODV file.

NOTE: The \Hypack_2011\ADCP folder also includes the Config_type_odv.cfg file which is used to import the HYPACK® ODV file to the third-party, ODV software.

4. **Click [OK].** Your selected file will be saved with a ODV extension, by default, to your \Hypack_2011*ProjectName*\ADCP folder.

EXPORTING YOUR CONFIGURATION FILE FROM ADCP IN SITU

Once you have your display options, filters and text export options set, you can save them all to an initialization file. This enables you to save one or more combinations of settings and be able to load them all, quickly and easily, with just a few clicks.

1. **Click the Export Out icon in the tool bar on the shell**.

2. **Select the Configuration File Type**.
3. **Name your file and click [Save].** Your selected file will be saved with an INI extension, by default, to your project folder.

ADCP PROFILE

The ADCP PROFILE program reads HYPACK® All format files and ADCP files (*.ADP or *.000) collected by the HYPACK® ADCP.dll and stored in the project's Raw folder.

NOTE The ADCP.dll driver reads the raw beam, ENU or boat-orientedformat. The ENU format is most commonly used.

The program then displays color-coded flow data with the channel cross section. It can print or plot the resulting cross section graphs. The ADCP PROFILE program also creates textual discharge reports that you can save and print, and generate geo-referenced DXF charts of your current vectors.

ADCP PROFILE PROCEDURE

1. **Start the program** by selecting UTILITIES-ADCP-ADCP PROFILE. The ADCP PROFILE window will appear as a tabbed dialog.
2. **Load your data files**. Select FILE-OPEN and select a file from the File Select dialog. You can load and individual file or a catalog file from your Edit directory and the corresponding ADCP files will load automatically.
3. **Set your view options**. These define how your data is displayed. Here, you make choices about the data displayed and the appearance of the graphs.
4. **Select the Velocity value** you want to graph from the list in the tool bar.
5. **Scroll through each line and view the data in each tab.** The line names are displayed in the tool bar. Use the arrows to select the section you want to view.
6. **Save your results.**
   - Print profile view.
   - Export 2-dimensional and 3 dimensional DXF charts.
   - Save the discharge report to a text file.

WINDOWS IN ADCP PROFILE

ADCP PROFILE is a tabbed window with a menu and tool bar. Each tab shows your data in a different way:

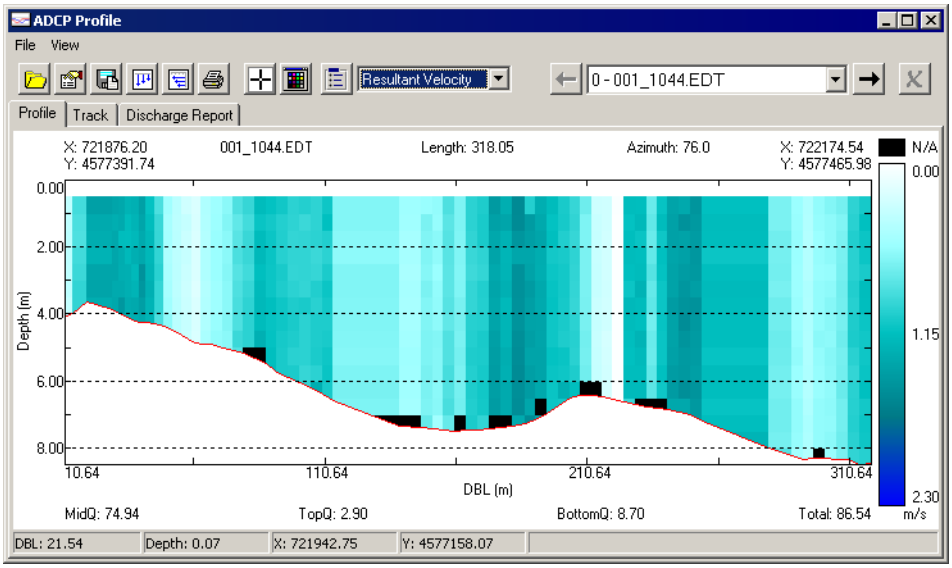
- Profile View

- Discharge Report

PROFILE VIEW WINDOW IN ADCP PROFILE

The Profile Tab previews the cross section graphs. You may also adjust the scale and segment of the cross section to include in the graph and customize the color settings.

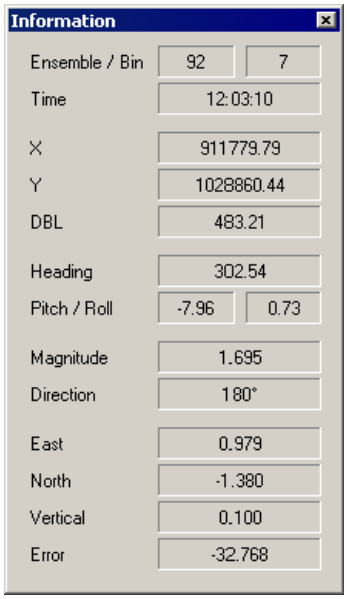
FIGURE 8-1. *The View Tab*



When you click on the Profile tab, the screen will present the first cross section of the file(s) you have according to the view options you have chosen.

An Information Window is provided to display statistics regarding the current cursor position in the Profile View.

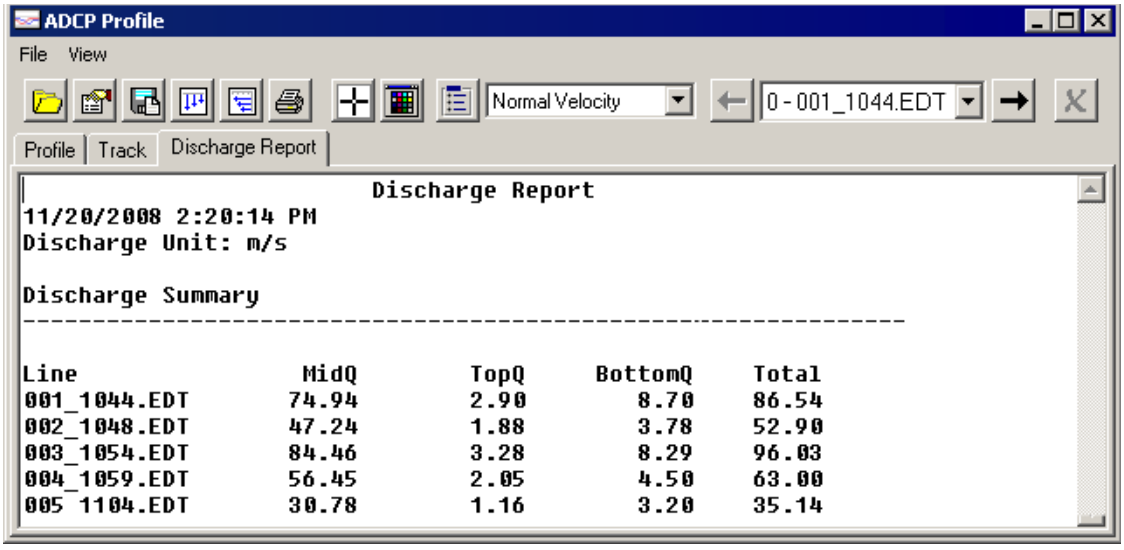
FIGURE 8-2. *Sample Information Window*



DISCHARGE REPORT

The Discharge Report tabdisplays an online preview of your discharge calculations. It presents the discharge calculations of the measured area (Mid Q) as well as the estimations for the Top, Bottom and Slope areas. (The Top Q values are based on the distance between the first good bin and the ADCP device. The Bottom Q values are based on the last good bin and the distance between that bin and the bottom.)

FIGURE 8-3. *Sample Discharge Report*



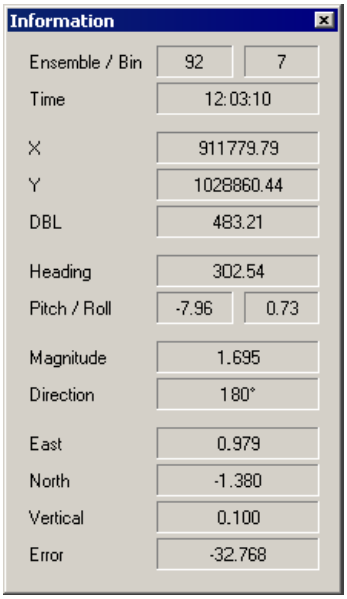
INFORMATION WINDOW

The Information Window providesdata about the bins in the ADCP profile.

To open the window, select FILE-FILE INFORMATION.

The data in the information window will update you move your cursor from one bin to another in the Profile display.

FIGURE 8-4. *ADCP Profile Information Window*



VIEW OPTIONS IN ADCP PROFILE

ADCP PROFILE has controls both on the tool bar and in the View Options dialog that affect the way your data is displayed.
From the toolbar, you can set the cursor mode and access the Colors and View Options dialogs.

- The **Colors dialog** enables you to modify your project colors. The Autoscale Colors option at the bottom of the View Options dialog breaks the color bands into very small increments. This has the effect of blending the color changes.

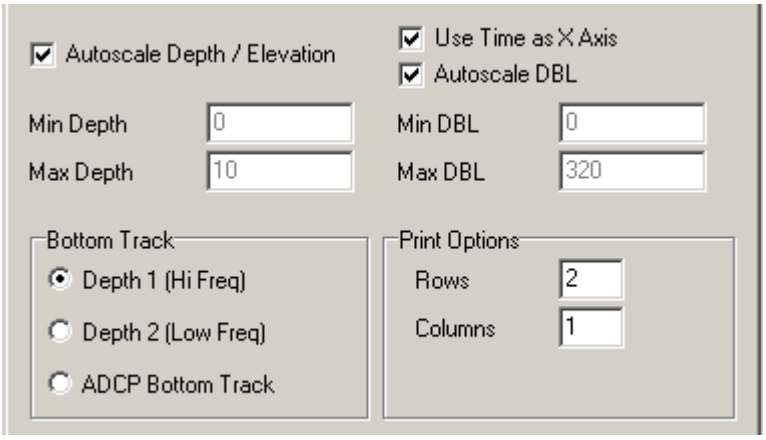
FIGURE 8-5. *ADCP PROFILE Tool Bar*

- **Cursor mode**: As you move the cursor over the Profile View, the status bar displays X, Y, Z, DBL and velocity at the crosshair position. The Cursor Mode determines the depth value displayed.
  - **Cross Hair:**shows the cursor position.
  - **Annotation:** shows the bottom depth at the cursor position.
- In the **View Options dialog** (F9) you define how your data is drawn in the graphical displays. It is a tabbed dialog; each tab effects a different aspect of the display.

PROFILE VIEW OPTIONS IN ADCP PROFILE

The options in the Profile tab of the View Options dialog (F9) affect the range of the profile displays, as well as the page configuration when you choose to print them.

FIGURE 8-6. *Profile View Options*



Use Time as X Axis: Use this option to label the horizontal axis based on the time in the data instead of DBL. This, in turn, enables you to read raw RDI data without any corresponding HYPACK® raw data for positioning.

- **With the AutoLabel option** in the Label tab, it labels the X axis with even time increments. (The units are determined by the time range in your data set.)
- **Without the AutoLabel option,** the Label and Tic Increments represent seconds.

Horizontal and Vertical Scale: The vertical and horizontal limits of the profile display are independently determined. You can manually set the **Minimum/ Maximum Depth and DBL** or allow the program automatically adjust (**Autoscale**) according to the ranges found in the data set.

NOTE The minimum depth designates the top of the chart. If you are working in elevation mode, you have to set the minimum higher than the maximum.

Bottom Track: You can choose to display echosounder depths (Depth 1 or Depth 2) or ADCP bottom track data with the flow data.

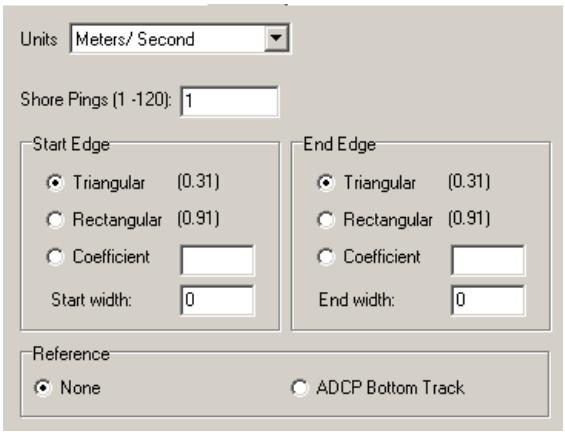
Print Options: You can print one or more profile views per page. Simply designate the number of rows and columns on each page.

NOTE The profiles will be scaled in such a way that the rows and columns fill your page. Therefore, you should specify rows, coluns and page orientation (in your printer setup) in a way that will maintain the approximate proportions of your profiles.

VELOCITY VIEW OPTIONS IN ADCP PROFILE

These settings affect how the velocities are calculated.

FIGURE 8-7. *Velocity View Options*



Velocity and **Discharge Unit** converts the velocity data to the selected units of measure.

Shore Pings is the number of subdivisions that the program should create between the first/last measured ensemble and Start/End Width point.

Shore Start Edge and End Edge options enable the program to estimate discharge data in the areas beyond the ends of your survey lines. It does this based on the data from the first/last measured ensemble. This can be particularly helpful in areas you cannot access to log data.

- **Start/End Width** is the distance between the start/end of the survey line and first/last ensemble.
- **Triangular** defined by a coefficient of 0.31.
- **Rectangular** defined by a coefficient of 0.91.

- **Coefficient** enables you to set the coefficient that best describes your end slope.

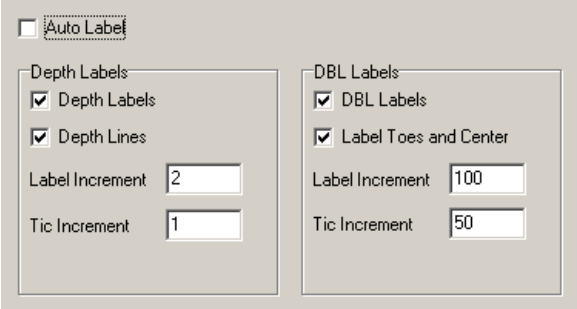
Reference:

- **Bottom Track** removes the effect of sensor motion in the velocities displayed in the graph.
- **None** graphs uncorrected velocities.

LABEL OPTIONS IN ADCP PROFILE

The Labels Tab contains settings that affect the labels on your profile graphs.

FIGURE 8-8. *Label View Options*



Depth Labels places numeric labels on the vertical axis of the graph.

DBL Labels places numeric labels on the horizontal axis of the graph.

Depth Lines places dotted lines across the graph at the level of each label.

Label Toes and **Center** mark toes and center, where it appears, on each line. The labels appear only on the top and tics appear on both the top and bottom line of the graph.

Label Increment and **Tic Increment** specify the distance between labels and tics on each axis. With the Use Time as X Axis option in the Profle View tab, and AutoLabel selected, these options label the X axis with even time increments. (The units are determined by the time range in your data set.) Without the AutoLabel option, enter Label and Tic Increments in seconds.

SAVING YOUR ADCP PROFILE REPORTS IN ADCP PROFILE

Once your ADCP data is loaded and the display is configured as you like it, you can export the displays of each window to other formats.

The output type of each window varies according to whatever is useful.

TABLE 8-1. *ADCP PROFILE Export Formats*

ADCP PROFILE Window	Output
Profile View	Print profiles
Profile View	2D and 3D Track View DXF
Report	Text File

PRINTING YOUR PROFILE VIEWS IN ADCP PROFILE

You can print one or more profile views per page. Print hard copies or generate electronic copies by printing to a PDF writer.

1. **Designate the number of rows and columns** of profile views on each page in the profile view options.

   NOTE The profiles will be scaled in such a way that the rows and columns fill your page. Therefore, you should specify rows, columns and printer settings in a way that will maintain the approximate proportions of your profiles.

2. **Click the Print icon on the tool bar.** The Windows® Print dialog will appear
3. **Set your printer options and click [OK]**.

EXPORTING DXF CHARTS IN ADCP PROFILE

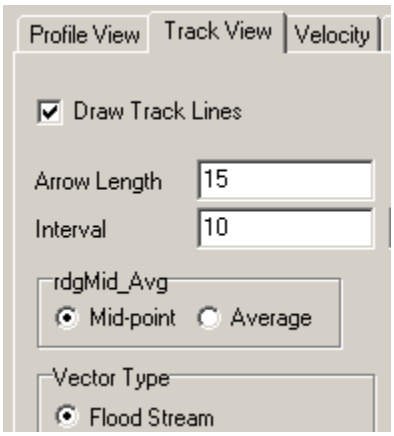
The track view shows the survey path with the current vectors. This data can be exported in DXF format to be displayed as charts in HYPACK® programs or in thrid-party programs. You can export two- or three-dimensional track view charts.

You can export track views of your current vectors to DXF format. Using the resulting files, you can:

- Display current vectors as background files in HYPACK®.
- Plot current vectors to smooth sheets in HYPLOT.
- Import them to other packages such as AutoCAD.

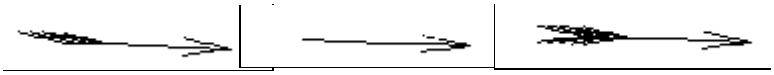
1. **Set your Track View display options.** You can choose to draw the vessel's track lines along with the current vectors and planned lines, and vary the vector type, length and spacing.

FIGURE 8-9. *Track View Options*



- **Draw Track Lines** displays the survey path with the current vectors.
- **Arrow Length** and **Interval** are user-defined in the units specified on the View Options Velocity tab.
- **Vector Type** indicates the type of arrow used to draw the currents.

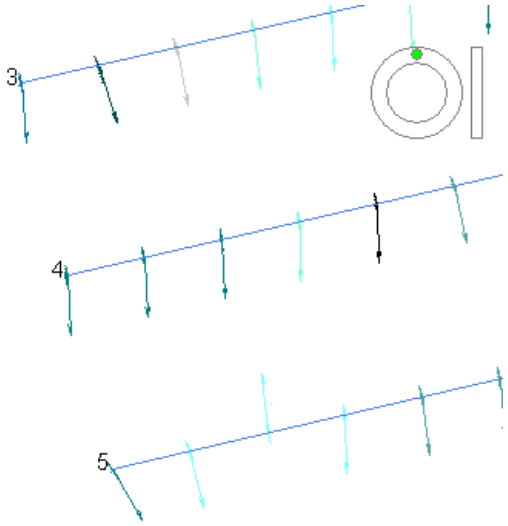
FIGURE 8-10. *Flood Stream (left), Ebb Stream (center), Restricted Current (right)*



2. **Generate your DXF.** We output to DXF in two formats:
   - **2D DXF:** In this case the vector arrows are all of the same size and the magnitude is noted with a label and color.

     To export 2D DXF files, select FILE-SAVE 2D DXF and name your file.

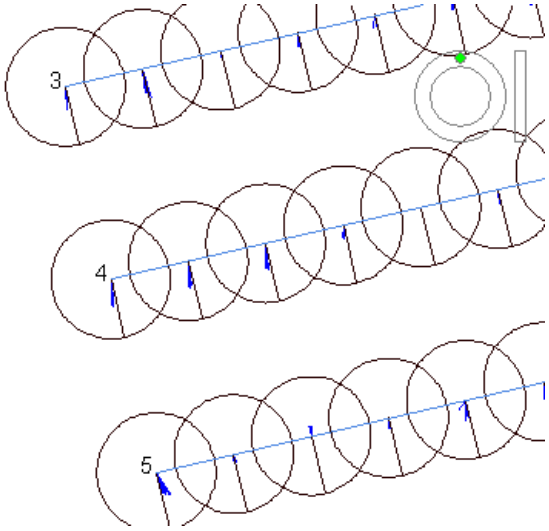
FIGURE 8-11. *Sample 2D DXF in HYPACK®*



- **3D DXF:** The vector arrows are scaled by magnitude relative to the circle which represents the largest magnitude value of the dataset.

  To export 3D DXF files, select FILE-SAVE 3D DXF and name your file.

FIGURE 8-12. *Sample 2D DXF in HYPACK®*



SAVING THE DISCHARGE REPORT TO A TEXT FILE IN ADCP PROFILE

Save the discharge report to an ASCII text file. Once the data is saved, you can view and print it with any text editor.

1. **Select FILE-SAVE REPORT** or click the Save Report icon. The File Save dialog will appear.
2. **Name your file and click [Save].** Your report will be saved, by default, to your project folder, with a TXT extension.

XYZ COLLECTOR

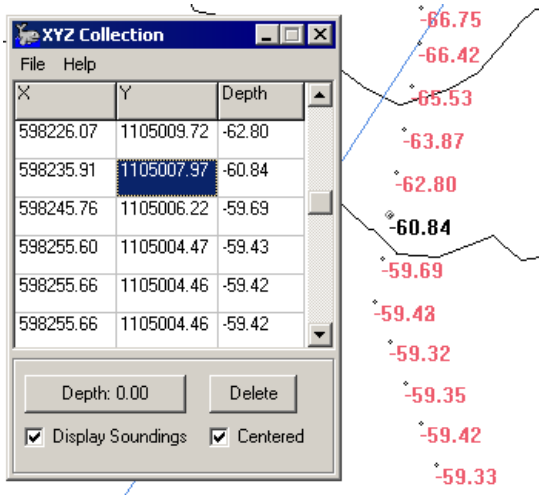
The XYZ Collector is a simple utility used to manually work with XYZ data. It is generally only useful for smaller data sets because all of the work is done manually.

- **Create an XYZ data file.** For example, you can create a soundings file based on the data on a raster chart. Just load the chart and use it to guide you while you gather the sounding data. The sounding data can then be displayed in HYPACK® and used in other programs that recognize the XYZ file format.

  TIP: You can mark each sounding location using the default depth of 0, then edit the Z-value in each record to the desired depth. However, if you have several locations with equal depth values. Set the depth , then double-click each location. Each location will be assigned the same Z. It could save you a lot of time over setting each individually!
- **Edit XYZ data** in a small XYZ or XYZ-date file.

1. **Open the XYZ Collector** by selecting PREPARATION-EDITORS-XYZ COLLECTOR. The XYZ Collection dialog will appear.

FIGURE 8-1. *XYZ Collection Dialog*



2. **Set the desired depth.**
   a. Click [Depth]. A dialog will appear.
   b. Enter the desired depth and click [OK].
3. **Double-click on the area map at each location** where you want soundings of that depth.
4. **Continue setting depths and clicking sounding locations until you have collected all of your data**.
5. **Save the file** by selecting FILE-SAVE and naming the file. The file will be saved, by default, to the project's Sort directory.

To delete any unwanted soundings in the file

Select the sounding to be deleted and click the exclamation icon.

To display this file:

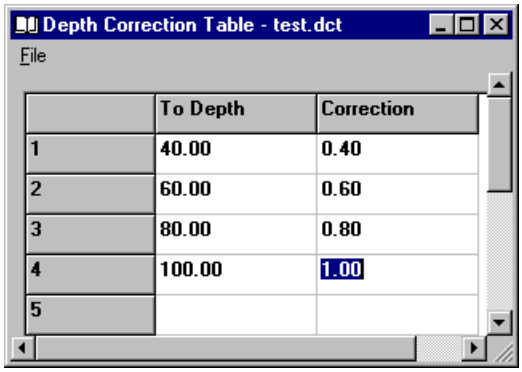
- **In the XYZ COLLECTOR** check '**Display Soundings'**.
  TIP: If you also check the '**Centered**' option and select a sounding in the spreadsheet, the area map will shift to center the sounding in the map.
- **In** HYPACK® load the file as you would any sounding file. (Right-click on the sort directory, select Add File and choose your XYZ file from the file selection dialog.)

SOUNDING ADJUSTMENT

The SOUNDING ADJUSTMENT program reads edited All format files and applies sound velocity corrections to them. These corrections are based on where Depth 1 falls in the Data Corrections Table and the data that you enter into it. The program adds the "fixed" corrections (not interpolated values) to the current sound velocity values in the data.

1. **Select PROCESSING-SOUND VELOCITY-SOUNDING ADJUSTMENT.** The Data Corrections Table will appear.

FIGURE 8-1. *Depth Corrections Table*



2. **Enter the depths and adjustment values to the Data Corrections Table.** In this example, depths less than 40 will receive the sound velocity correction of 0.40, depths from 40-60 will receive the correction of 0.60, etc.
3. **Save your Depth Corrections Table** by selecting FILE-SAVE or FILE-SAVE AS and giving it a name. Your data will be saved to your project directory with a .DCT extension.
4. **Apply the corrections to your data** by selecting FILE-GENERATE CORRECTIONS. Select the edited All format files you wish to correct from the list in the file manager. The corrections will be automatically made.

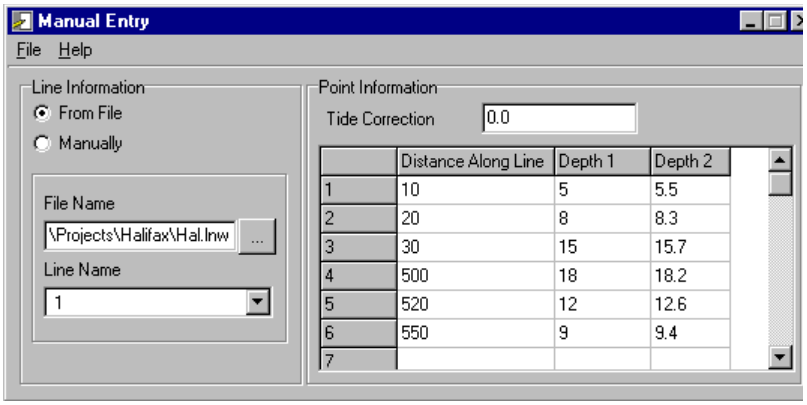
If you are correcting single beam data, you can see the results by viewing your data in the SINGLE BEAM EDITOR.

MANUAL ENTRY PROGRAM

Manual Entry enables you to create your own depth readings along a planned line file and store it in a HYPACK® ALL format file. This utility was designed for you to enter tag-line distance and depth information.

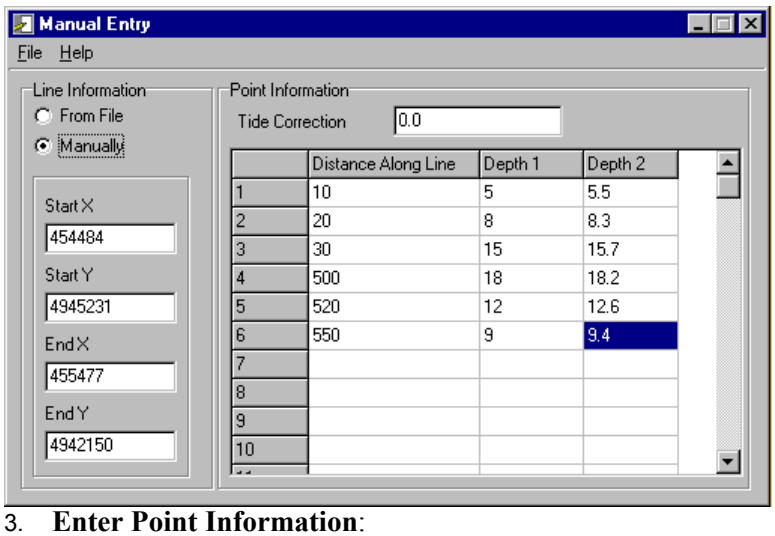
1. **Start the program** by selecting UTILITIES-FILE WORK-MANUAL ENTRY or by clicking on the File Work icon and selecting Manual Entry from the drop-down box. The Manual Entry window appears.
2. **Enter Line Information:** Choose to use a pre-existing planned line file or to manually create the start and end X and Y coordinates as you go.
   - **FROM FILE** enables the Line File information.

FIGURE 8-1. *Manual Entry Dialog—File Mode*



   i. **Select your Line File.** Click on FILE NAME then [Browse] and select the line file for which you want to create data. The remaining Line Information will automatically be displayed.
   ii. **Choose which line in the file** you want to work with.
   iii. **Enter the additional sounding information** in the spreadsheet.
   iv. **Save your file**. Click on FILE-SAVE and name your file. It will be saved to the edit directory.
   - **MANUALLY** disables the Manual Line information. You must enter the Start and End X and Y coordinates for yourself. Otherwise it works the same way as the From File method.

FIGURE 8-2. *Manual Entry Dialog—Manual Mode*



3. **Enter Point Information**:
   - The **Tide Correction** value will be added to the raw depth.
   - **Distance Along Line** and **Depth**: Enter this data for each point that you want to create.

NOTE: If you decide you want to start over, select FILE-NEW to clear the spreadsheet.

4. **Save your file** by selecting FILE-SAVE and naming your file. If you have used a previously created Line File, your new file will be saved to the same directory unless you indicate another one at this time.
5. **Return to HYPACK®** by selecting FILE-CLOSE.

METADATA

In the past, geospatial data collection of any kind focused mainly on the data itself with little regard for documentation. Proper documentation that could answer questions about the content, quality, accessibility and other characteristics of the data did not necessarily exist.

The answers to these questions of content, quality etc. are called Metadata. Metadata is, loosely defined by many, as “Data about Data”. Metadata covers four areas:

- Information needed to determine the sets of data that exist for a geographic location.
- Information needed to determine if a set of data fits a specific need.
- Information needed to acquire an identified set of data.
- Information needed to process and use a set of data.

To provide compilers and users of geospatial data with a common set of terminology, the FGDC (Federal Geographic Data Committee) created and approved the Content Standards for Digital Geospatial Metadata.

The FGDC standard is broken down into seven main sections:

Section	Content
Identification Information	Basic information about the data set.
Data Quality Information	A general assessment of the quality of the data set.
Spatial Data Organization	The mechanism used to represent spatial information in the data set
Spatial Reference Information	The description of the reference frame for, and the means to encode, the coordinates in the data set.
Entity and Attribute Information	Information about the information content of the data set, including the entity types, their attributes, and the domains from which attribute values may be assigned
Distribution Information	Information about the distributor of and options for obtaining the data set.
Metadata Reference Information	Information on the how current the Metadata information is, and the possible responsible party.

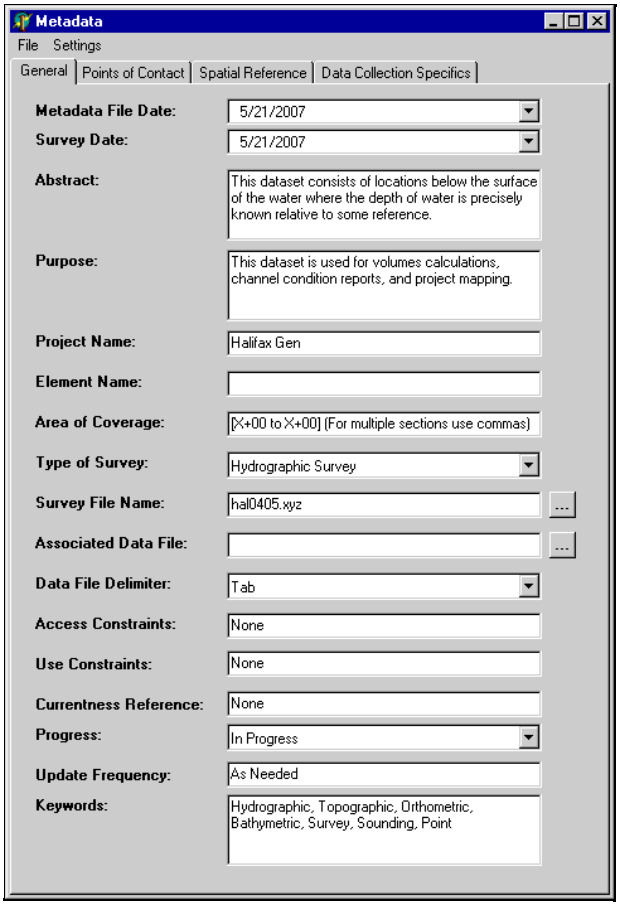
Metadata can be created in HYPACK® with the either of two programs. Metadata created with the FGDC-compliant METADATA program adheres to the FGDC standard.

SIMPLIFIED METADATA PROGRAM

HYPACK® also includes a newer, more abbreviated METADATA program that displays a tabbed form, populated with information it reads from your project files. It is a simple process to review and modify the information in the forms and generate your report.

1. **Launch METADATA** by right-clicking an XYZ file and selecting 'Metadata...'. The tabbed dialog will appear.

FIGURE 8-1. *Simplified METADATA*



2. **Review and edit the content** of the forms for your project.
3. **Generate the report** by selecting FILE-SAVE AS and naming your report. The report will be saved, by default, with a GEN extension to the project folder. it may be read using any text editor.

FGDC-COMPLIANT METADATA PROGRAM

All sections and any fields in a section of the standard are either Required, Optional, or required where applicable. To complete a section, all of the required fields under that section must be completed.

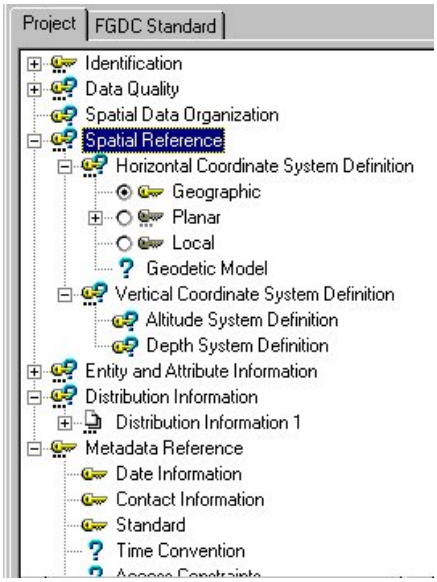
In the case of the Standard as a whole, sections 1 and 7 must be "completed" for the file to be compliant with the FGDC standard.

CREATING METADATA

1. **Start the Metadata program** by selecting UTILITIES-FILE WORK-METADATA.
2. **Enter the data in the tree items necessary for your report.** Identification and METADATA Reference tree items are the minimum required for creating a METADATA project. Complete also any others that are applicable to the type of report you are creating.
3. **Build your Metadata report** by selecting PROJECT-BUILD METADATA FILE.
4. **Save your data to *.GEN and *.MET files**.

NAVIGATION THROUGH METADATA PROJECTS/FILES

FIGURE 8-1. *Browsing the Tree View*



The tree view can be thought of as a layout of your Metadata project. The view shows all of the sections that are in the standard. Items with the + or - symbols can be expanded or collapsed by clicking the item name or clicking on the + or - respectively.

Some items in the tree view are grouped together with Selection button symbols. Only one item of this “group” can be selected at one time.

Notice the color of the key symbols beside each of the Selection buttons. The items (sections) which appear disabled are not selected and therefore are not considered part of your METADATA project.

METADATA SYMBOLS

The following symbols will appear throughout the METADATA program.

TABLE 8-1. General Symbols

	Required field or section
	Optional section
	Required where applicable section
	A section which is a member of a group of ‘n’ items

TABLE 8-2. Symbol Overlays

	The section is complete.
	The section is in progress.

TABLE 8-3. Symbol Modifiers

	The section is disabled.
	The section itself has no properties.

TABLE 8-4. Other Symbols

	Selection Button - selected
	Selection Button - unselected

NOTE: The used in ‘Symbol Modifiers’ serves only as an example. All of the other symbols may be modified in the same manner.

ENTERING DATA IN YOUR METADATA REPORT

Every item in the tree that does not have the "..." modifier on the item’s symbol, has a property dialog associated with it. To reach the property dialog for any of these items simply double click on the item in the tree or

right click on the item to bring up the pop - up menu and then select Properties. (The pop-up menu does not come up if you have a dialog already displayed.)

FIGURE 8-2. *Choosing to view the Properties*

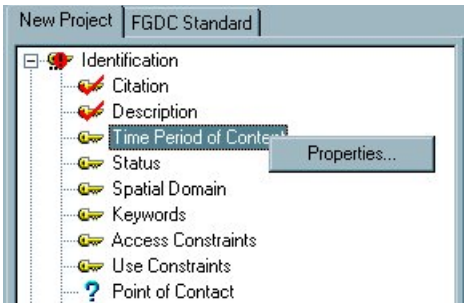
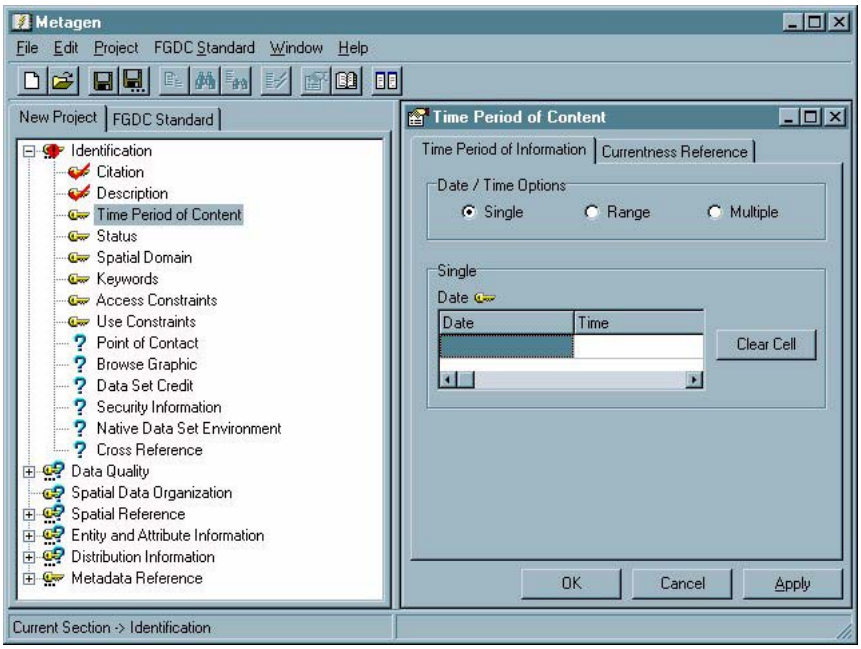


FIGURE 8-3. *"Time Period of Content" dialog from the "Identification" Section*



All data entry is done in the property dialogs.

The three buttons on the bottom of every property dialog are always the same ([OK], [Cancel], [Apply]), however, the contents of each dialog will change according to the item you are on in the tree. The three "standard" buttons always mean the following:

- **[OK]:** Save changes and close dialog.
- **[Cancel]:** Close dialog discarding any changes.
- **[Apply]:** Save changes without closing dialog.

Notice at the top of the 'Date' field there is a key symbol. This indicates that the 'Date' field is a required entry field. After each of the required entry fields is complete, the tree-item selected for edit is complete.

After saving changes to our data in a property dialog, you may notice changes to the tree item we had selected for editing. If the minimum number of required entries for the current tree - item (indicated by the key symbol) are complete, the symbol for the current tree item will appear with a check mark over it. If some, but not all, of the required entries for the current tree item are complete, then the current tree item will appear with a red dot over it.

These changes will reciprocate up the entire tree. (In some cases the 'Status' change of one tree item will cause changes in other items above it.) Notice in the previous figure, the changes in the tree after saving changes to our property dialog.

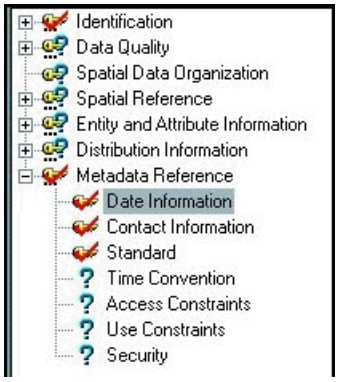
- The 'Citation' and 'Description' items under 'Identification' in the tree have the Completed (Check Mark) symbol over it.
- The 'Identification' item in the tree has the In Progress (Red Dot) symbol over it.

Since the 'Citation' and 'Description' items are the only items under 'Identification' that have been completed the 'Identification' item is clearly 'In Progress'.

BUILDING THE *.MET FILE AND SAVING THE *.GEN FILE

Building a *.MET file is only possible when you have completed at least the 'Identification' and 'Metadata Reference' sections. They are complete when the tree view shows red checks on those sections.

FIGURE 8-4. *A Complete Project*



When these conditions are met you will see both [Build All] and PROJECT-BUILD METAFILE become active. (Notice in the Tree view, that both of the required tree-items are complete.)

FIGURE 8-5. *The Build All button (left) and the Build Metafile option under the Project menu (right)*

***.MET** is a Metadata file. This is the Metadata file you build while in the Metadata program. It is a formatted ASCII text file and is compliant to the FGDC standard. A portion of a *.MET file appears as follows:

Identification_Information:

Citation:

Citation_Information:

Originator: David Hodges(Ed.)

***.GEN files** are METADATA Project files. This is the file you save while in the METADATA program. It is NOT compliant to the FGDC standard.

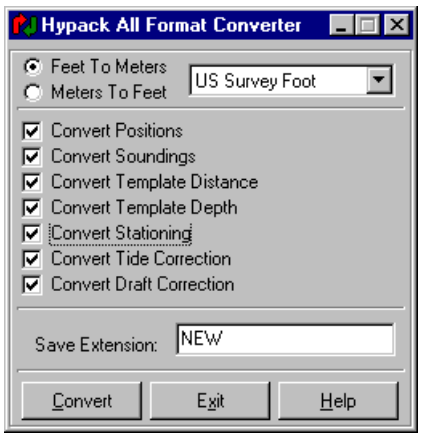
At any time when the METADATA program is running, you may save the current METADATA project by selecting FILE-SAVE or by clicking the Save icon. You can save the current project under a new name by selecting FILE-SAVE AS or click the Save As icon. The project will be saved with the *.GEN extension to the project directory.

METRIC FILE CONVERTER PROGRAM

The METRIC FILE CONVERTER opens All format files and converts the user-specified distances from meters to feet or from feet to meters.

1. **Open the Metric File Converter** by selecting UTILITIES-FILE WORK-METRIC CONVERSION. The Metric File Converter will appear.

FIGURE 8-1. *Metric File Converter*



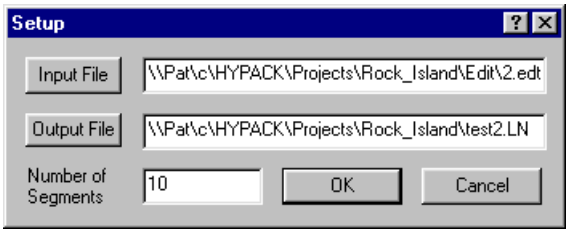
2. **Choose which conversion you wish to make** by clicking on the appropriate radio button.
3. **Choose US Survey Feet or International Feet**.
4. **Choose the measurements you wish to convert**. You may choose any number of options.
5. **Choose a file extension for your converted files**. The default extension is *.NEW, but you may choose another if you're feeling creative.
6. **Click [Convert]** and the calculations will be made on the specified data. The converted file will be saved to the project edit directory with the same filename but the new extension.

PATHFINDER PROGRAM

The PATHFINDER program reads the positions from the user-selected sounding files and creates a Planned Line file (*.LNW) that defines the track line of the survey boat.

1. **Select UTILITIES-FILE WORK-PATH FINDER**. The Pathfinder dialog will appear.
2. **Select SETUP** and a secondary dialog will appear.

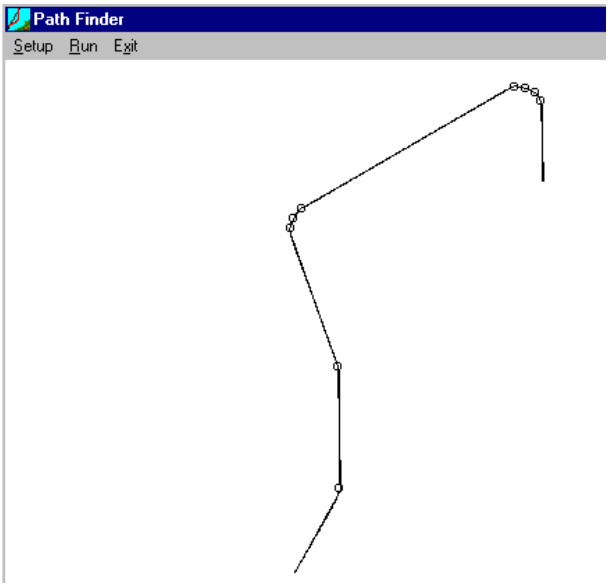
FIGURE 8-1. *PATHFINDER Setup Dialog*



3. **Select the sounding catalog** file.
4. **Name the resultant Line file**.
5. **Define the number of line segments to be used**. The more segments, the more closely the LNW File will be able to match a curving track line. There is no maximum number of segments you can use. It's a matter of trial to determine the optimal number of segments to use for each situation.
6. **Click [OK]** to return to the PATHFINDER window.
7. **Select RUN**. The resulting line file will be drawn to the Pathfinder window and saved to the specified file and location.

NOTE: If you have chosen a catalog file, each line in the file will be drawn individually and you will be asked if you wish to continue to the next line.

FIGURE 8-2. *Sample Results of Running PATHFINDER*



If you are not happy with the results, re-open the setup dialog and edit the input.

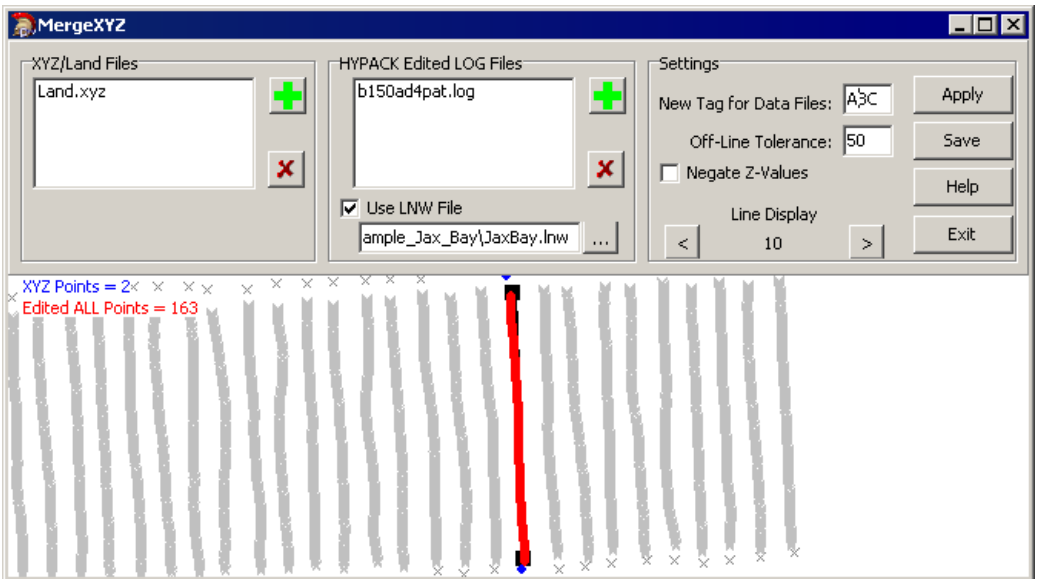
MERGE XYZ

The MERGE XYZ program enables you to add XYZ data to edited All format files. The program maps the XYZ data to the lines that fall within the user-defined Off Line Tolerance from the All Format data or a planned line file. It then creates a new catalog of All format files that include the data from both data sets and have a user-defined extension. The new catalog file will be named with the original catalog name with the new tag appended. For example, "catalog.log" will become "catalognew.log".

Typically, this program is used to merge land survey data that falls within the offline tolerance limit with your hydrographic data.

1. **Select UTILITIES-FILE WORK-MERGE XYZ** and the Merge XYZ dialog will appear.

FIGURE 8-1. *Merge XYZ dialog*



2. **Enter the two file sets that you want to combine.** Click the corresponding [+] buttons to browse for them.
   - **Land Files:** Open one or more XYZ files.

     TIP: To load more than one file of either XYZ or All format, hold the Ctrl key and select each one in the File Select dialog.
   - **Survey Files:** Open a catalog of All format files from your hydrographic data.
3. **If you want map all of the survey data to a planned line file**, check 'Use LNW File' and load the planned line file by clicking -...] and browsing for the line file.
4. **Define the tag for your new data files**.
5. **Click [Apply]** and preview your results in the lower part of the dialog. Use the Line Display arrow buttons to highlight each line in sequence.

6. **The Offline Tolerance is** the largest allowable distance between the position of the XYZ data points and the survey line information in the All format file. If there is no planned line within this distance from a data point it will be disregarded.

NOTE: If your XYZ data extends beyond the end of the survey line, the program will calculate a theoretical extension of the survey line and calculate the offline tolerance based on this extension.

7. **If you want to invert your depths** check Yes under Negate Z-values.
8. **Click [Save]** and the new files will be created and saved, by default, to the project's Edit directory.

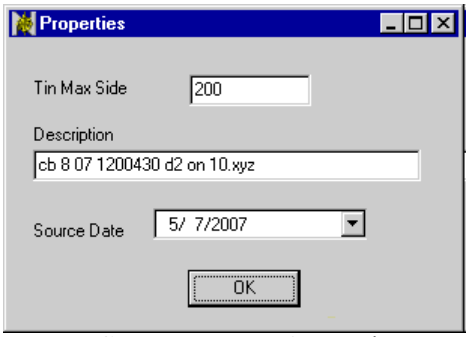
XYZ MANAGER

The XYZ MANAGER creates a database that contains all of the XYZ data from multiple surveys. From that database, you can select any number of member files and export a merged XYZ data set. The XYZ MANAGER does not simply combine all the data points into one file, but analyzes where the selected data files overlap and, based on the file's Modified Date and Time, includes *only the most recent* in the output XYZ file.

CREATING A DATABASE IN THE XYZ MANAGER

1. **Launch the XYZ MANAGER** by selecting UTILITIES-FILE WORK-XYZ MANAGER. The program dialog will appear.
2. **Select FILE-NEW DATABASE** and name your database.
3. **For each XYZ file to be included**:
   - **Select DATABASE-IMPORT SOUNDINGS** and select your file from File Select dialog. The Source Properties dialog will appear.

FIGURE 8-1. *Source Properties Dialog*



   - **Set the Properties**. When an XYZ file is added, the program connects the data points to create a TIN Model. It is the perimeter of this model that describes the area covered by the data set.
     - **Max TIN Side** determines the maximum distance between connected points. The ideal number depends on the density of your data set. A value too large connects unrelated points, while a value too small leaves holes in your model. The **default Max TIN Side** can be set by selecting FILE-GENERAL SETTINGS.

Beware!

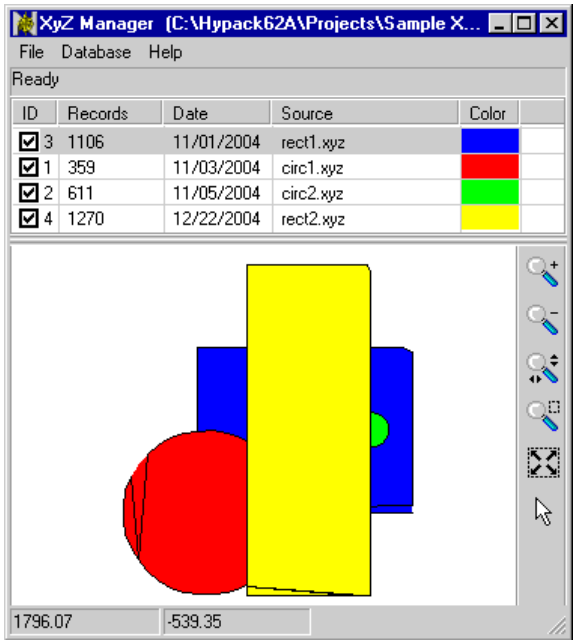
BEWARE! If the leg is set too short, you may be alerted that the "bordering of soundings failed" and the sounding area will not be drawn to the dialog. If this occurs reopen the Source Properties dialog (by right clicking the file name in the database list and

selecting "Properties") and enter a larger value. A new model will be drawn to your screen.

- **Description** defaults to the file name. You can enter something more descriptive if you wish.
- **Source Date** defaults to the Windows® Last Modified date, but you can modify it, which will affect the order of precedence in the XYZ Manager.

4. **Click [OK]**. The area each file covers is color-coded and displayed in the XYZ MANAGER window.

FIGURE 8-2. *Four files loaded to the XYZ Manager*



The standard window tools on the right may be used to adjust the display.

5. **Save the database** by selecting FILE-SAVE DATABASE. All of the files loaded are now members of the database. At any time, you can use the XYZ MANAGER to open the database (FILE-OPEN) and add new data files or export an XYZ data set.

To delete a file from the database, right-click on it in the XYZ Manager and select "Delete" then resave the database.

TRIMMING DATA WITHIN A BORDER FILE WITH THE XYZ MANAGER

The XYZ MANAGER can trim any XYZ data in your database that falls inside the area defined by a border (*.BRD) file.

NOTE: This operation affects all data loaded to the database, regardless of whether it is selected for display in the XYZ MANAGER.

1. **Launch the XYZ MANAGER and** load **the database containing the data** you want to trim.
2. **Select DATABASE-DELETE SOUNDINGS INSIDE BORDER.** A File Select dialog **will** appear.
3. **Select the border file with which you want to trim your data and click [Open].** The **program** will trim the data set and display the results.
4. **Save the trimmed data** to your project.

NOTE: This will not appear in the XYZ MANAGER as a 'clean' cut, exactly to the border file. All soundings that fall within the border are removed and, the resulting opening is drawn based on the remaining soundings and the user-specified TIN Max Side for each file.

FIGURE 8-3. *Original Data Set with Border File*

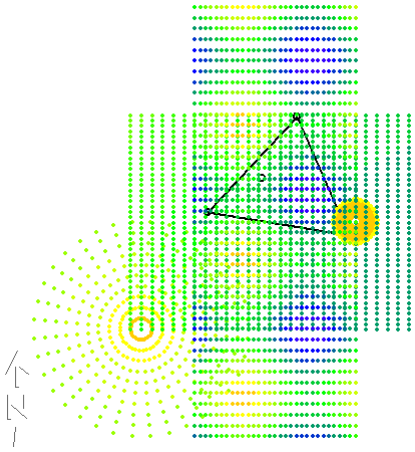


FIGURE 8-4. *Trimmed Data Set in the XYZ MANAGER*

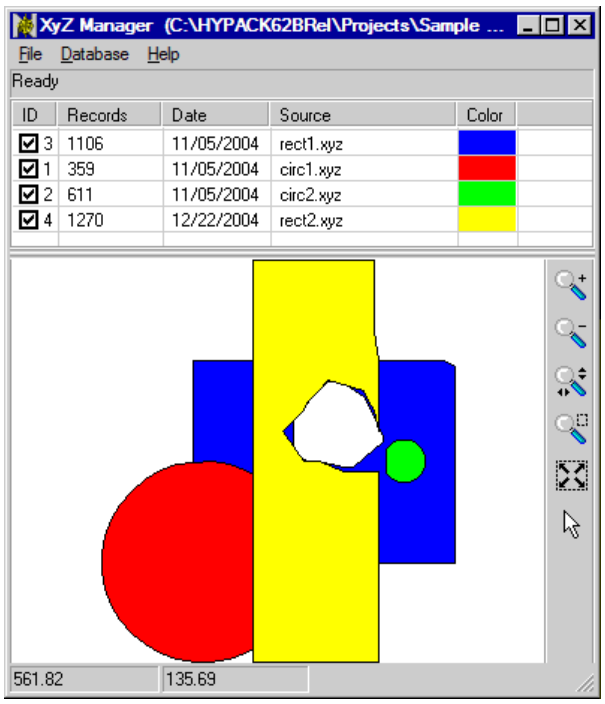
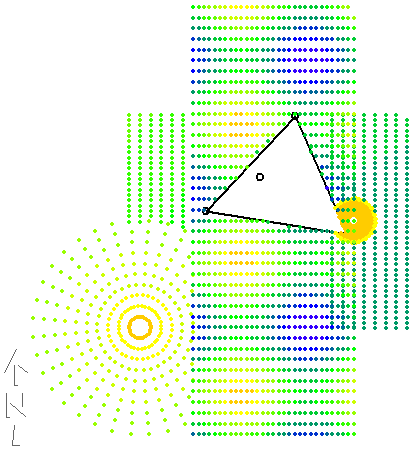


FIGURE 8-5. *Trimmed Data Set HYPACK®*



To reverse this deletion, select DATABASE-RESTORE ALL DELETED SOUNDINGS.

EXPORTING XYZ DATA FROM THE XYZ MANAGER

1. **Open your database by selecting FILE-OPEN and the name of your database.**
2. **Select the files to be included** in the exported data by checking the corresponding checkboxes. Only those data sets will be drawn in the dialog.

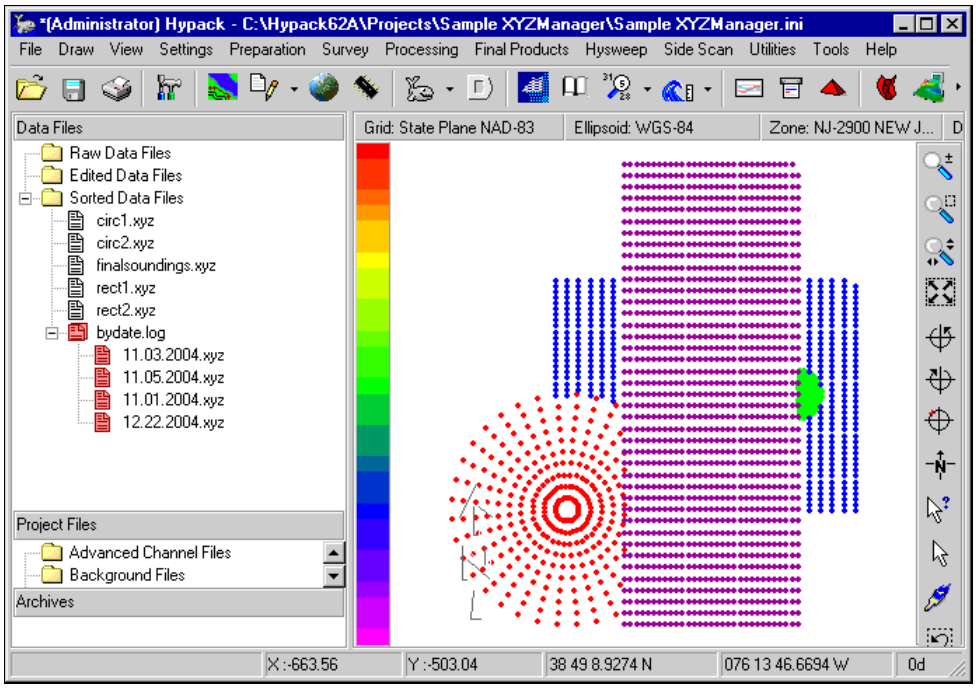
3. **Export your soundings. Select DATABASE-EXPORT FINAL SOUNDINGS and name your export file.** The new, merged data will be saved, by default, to your project's Sort directory.

   You can export:

   - **A single, merged XYZ file** where the older soundings are omitted in the area where the files overlap.
   - **A series of XYZ files, named by date**, each omitting soundings where later files overlap. .If there is more than one file with the same date property, an underscore followed by a number will be added to the file name create a unique file name in the project. (Ex. 11.03.2007_1.xyz)

   The following figure shows sample merged files displayed in HYPACK®.

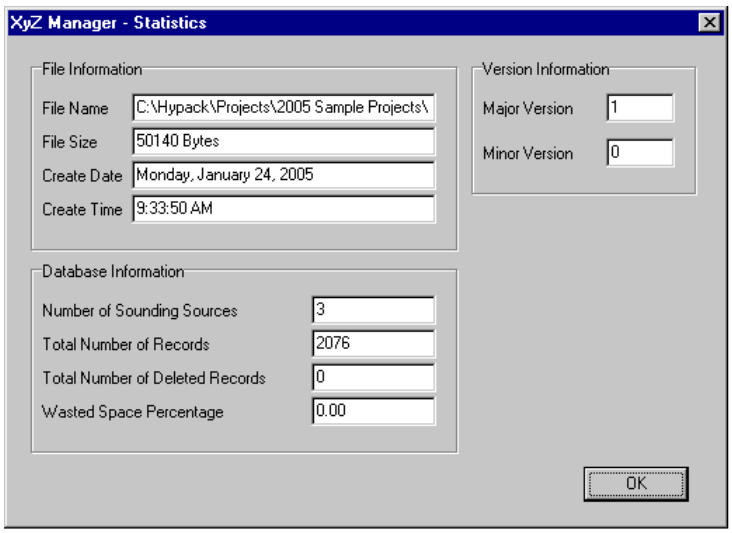
FIGURE 8-6. *XYZ LOG File by Date in HYPACK®*



DATABASE STATISTICS IN THE XYZ MANAGER

Select DATABASE-STATISTICS to display an assortment of information regarding the database and the data contained in it.

FIGURE 8-7. *Database Statistics*



UNIVERSAL INPUT PROGRAM

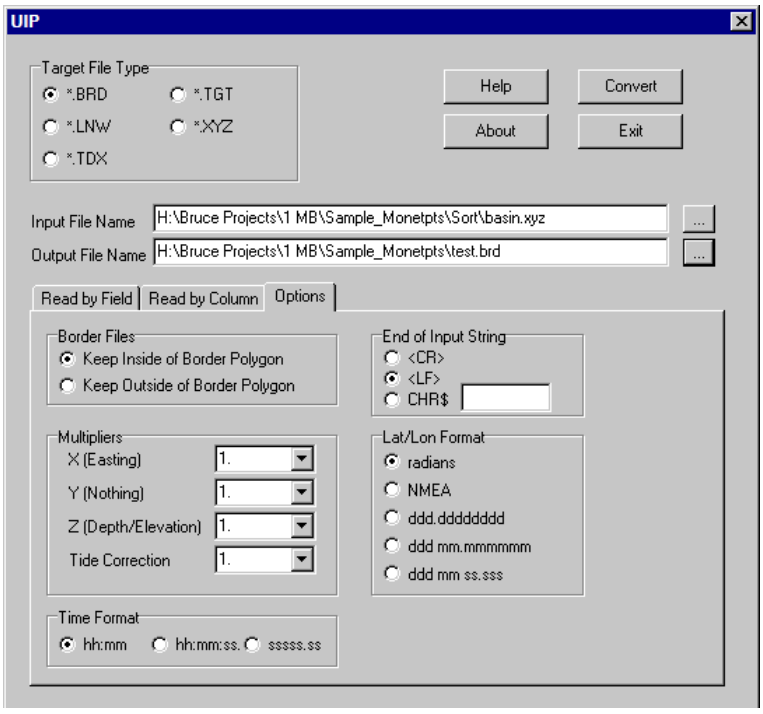
The UNIVERSAL INPUT program allows you to import data from text files to generate several of our HYPACK® file types. You can now import those coordinates you have listed in a spreadsheet or text file to quickly and easily create some of most common HYPACK® support files.

UNIVERSAL INPUT can also be used to extrapolate data from files, such as HYPACK® Raw data files or mixed NMEA strings, where you can distinguish the lines via a constant starting tag.

RUNNING THE UNIVERSAL INPUT PROGRAM

1. **Launch UNIVERSAL INPUT** by selecting UTILITIES-FILE WORK-UNIVERSAL INPUT.
2. **Under Target File Type, select the type of file** you want to generate.
3. **Load your Input File** by clicking the corresponding ellipses button and setting the path and file name.
4. **Name your Output File** by clicking the corresponding ellipses button and setting the path and file name.
5. **Set your options.**

FIGURE 8-1. *UNIVERSAL INPUT*



6. **Describe your input string.** You must tell the driver, either by field or by character numbers, where to read data from the lines in your input file.
7. **Click [Convert].** The output file will be generated. 'Done' will appear in the status bar when the process is complete.

INPUT FILE FORMATS FOR UNIVERSAL INPUT

The **Input file** is an ASCII text file. The values in each line may be comma, space or tab delimited and it may contain values other than what you need to generate your chosen output format. The following table lists the information required to generate each output file type.

File Type	Required Information
BRD	X, Y
LNW	X1, Y1 for the start line point and X2, Y2 for the end line point. **NOTE:** UNIVERSAL INPUT only generates single-segmented lines.
TDX	Date, Time, Tide Correction
TGT	X, Y
XYZ	X, Y, Z

The information for each output type must be formatted according any of the following rules:

- The same position in each line of the input file.
- The same position in each line with the specified Key Tag.

SETTING YOUR UNIVERSAL INPUT OPTIONS

Output settings are on the Options tab. Not all of the options are applicable to all of the output types. The following table shows the applicable options for each output type.

Option	Output Types	Function
Border Files	BRD	Specify whether you wish the In/Out point of the Border file to be inside or outside of the bordered area.
Multipliers		

Option		Output Types	Function
	X, Y	BRD LNW TGT XYZ	Multiply the values read from your input string and use the product value in the output string. Most multipliers are limited to one of four options • 1 • -1 • 3.28084 (converts value from meters to feet) • 0.30480 (converts value from feet to meters)
	Z	XYZ	
	Tide Corr.	TDX	
Time Format		TDX	Describes the format of the time in the input string.
Lat/Lon Format		XYZ	The Lat./Lon. input format tells the program how to convert the data to XY. Select the format in which your Lat./Lon. input is expressed.
End of Input String		All output types	Describes the end character of each string. Choose from carriage return, line feed or describe another character.

DESCRIBING YOUR UNIVERSAL INPUT STRINGS

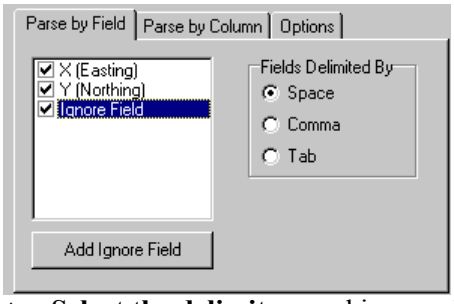
Parsing is the process of the driver extracting values from the input data. The driver can either parse by field or by column, but you must first describe where in the input strings it will read your output values.

Select the tab according to how you want to parse your data. The content of the tab varies according to the selected Output type.

PARSING UNIVERSAL INPUT STRINGS BY FIELD

Parsing by field reads values between the delimiters. In the field list, you will describe where each value the driver must read resides in the string.

FIGURE 8-2. *Describing Strings by Field*



1. **Select the delimiter** used in your input strings.
2. **Create an ignored field for each value in your string that the driver is not required to read**.

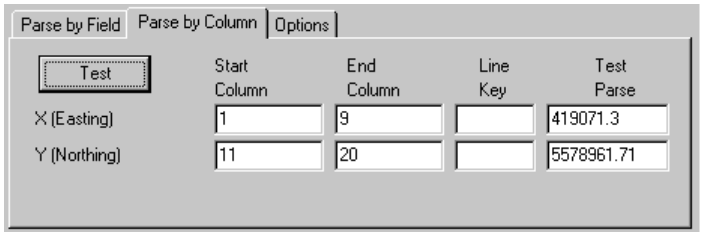
3. **Click and drag the labels into the order** in which they appear in your input string.
4. **Click [Convert]**.

PARSING UNIVERSAL INPUT STRINGS BY COLUMN

Parsing by column reads the values by the character position in the input string. (For example, the first character in the string is column 1.)

1. **Select the Parse by Column tab**.
2. **Describe where each value lies by its first and last character position**.
3. **Click [Test]** and confirm your results in the Test Parse column.

FIGURE 8-3. *Parsing by Column*



In some cases, you may need to read values from different data strings. The **Line Key** may be used to distinguish between different lines in your input file. If you enter a Line Key, the driver will read the value only from a string that begins with the defined character or ***characters.***

This option may be useful to extract data from NMEA or HYPACK Raw files which begin with tags identifying the data content of the string.

SEABED STATISTICS

SEABED STATISTICS is the routine where you can define a set of classifications for your project area in a Seabed ID Square.

The **Seabed ID Square** includes:

- A list of bottom types
- Their corresponding E1 and E2 ranges from the echosounder data. (You have to have a Seabed ID system.)
- A seabed identification color and number for each bottom type.

All of the data is saved to your project in an *.SIX file.

The **Seabed ID device driver** uses the SeabedID Square during SURVEY to apply classification numbers for each sounding record according to the E1-E2 range in which it falls. You can use these Seabed ID numbers to color your matrix in SURVEY or HYPACK®, or plot your soundings and track lines in HYPLOT. A TIN Model drawn with an XYZid file will draw to the screen using Seabed ID colors. You may also export your soundings in limited formats.

SEABED STATISTICS can also read All format data containing seabed ID information (the E1 and E2 data), and graph the distribution of each set of data. The graph also indicates the return ranges within which 68% and 95% of the returns fall.

CREATING A SEABED SQUARE IN SEABED STATISTICS

Before you can define the square, you must collect some sample data in various parts of your survey area where the bottom compositions differ to determine what bottom types exist and what their corresponding E1 and E2 ranges are. The number of readings necessary will vary depending on how much your survey area varies.

If you are working in the same general area of the world where the geological conditions are similar, it may be possible to use the same square for several projects. However, if the bottom types are significantly different, you will have to create a seabed ID square appropriate to each project area. (You wouldn't use the same square file in the Mississippi delta as you would on the rocky coast of Maine.)

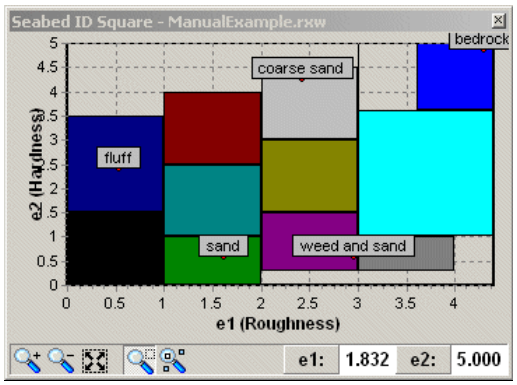
Once you have gathered this information, you are ready to build your Seabed ID Square.

1. **Launch the SEABED STATISTICS** by selecting UTILITIES-SEABED -SEABED ID.

   The Seabed ID window displays five resizable windows that can be toggled on and off through the View menu.

2. **Select FILE-NEW SEABED ID SQUARE**. The screen will clear, ready for the new information.
3. **Load calibration data (optional).** You can load your data files or just representative "calibration points" from each bottom type area to guide you.
4. **Define your bottom types with their corresponding E1 and E2 ranges**. You can load your data files or just a representative "calibration point" from each bottom type area to guide you.

FIGURE 8-1. *Seabed ID Square in Seabed Statistics*



5. **Modify the seabed identification colors (optional).** SEABED STATISTICS automatically assigns colors to each color range, but you can change them by double-clicking on the sample color to the left of each range description. A color dialog will appear for you to select your desired color.
6. **Save the square** by selecting FILE-SAVE SEABED ID SQUARE and naming the file. The file will be saved with a SIX extension in the project directory.

NOTE: You can choose to also save the same colors and ranges to the project's Hypack Color File (*HCF) which will allow you to display your data using your seabed identification colors.

LOADING CALIBRATION DATA TO SEABED STATISTICS

You can enter your sample data files, or manually enter information derived from them, to be displayed in the Seabed ID Square window. This data is useful to guide you while you define your E1 and E2 ranges for each bottom type.

LOADING DATA FILES TO SEABED STATISTICS

Select FILE-ADD MATERIAL then the Raw or All format files from the file selection dialog. When you do this the files are listed on the tree view file list at the left of the main window and displayed in the Seabed ID Square window.

Ideally, there would be one file for each bottom type. Whether you load them individually or using a LOG file, each file will display in a different color (up to 15) in the Seabed ID Square window.

Manually Assigning Colors:

Assign colors manually to each file or to all of the files in the catalog.

1. **Right-click** on **the file or catalog** in the tree view.
2. **Select 'Choose Color' and select your color** from the color dialog.

If you have right-click on a catalog, all files contained in the catalog will all be assigned the same color.

FIGURE 8-2. *Tree View File List*

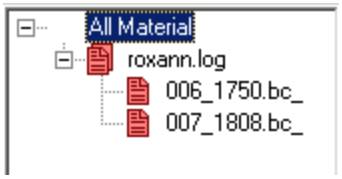
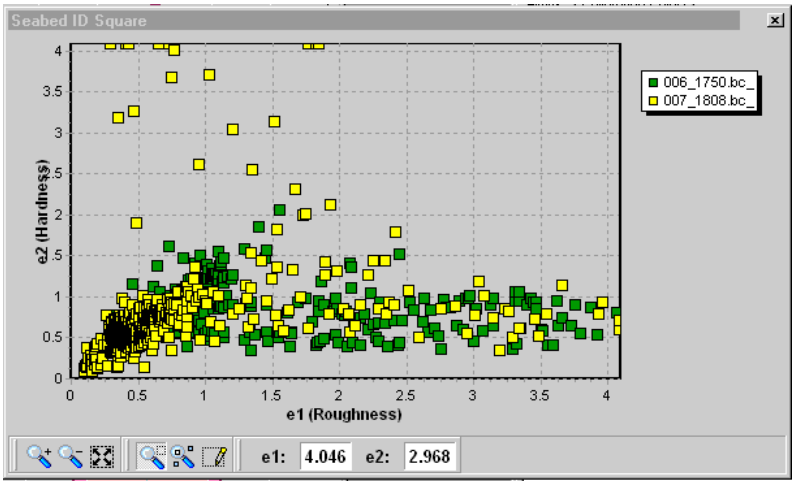


FIGURE 8-3. *Viewing Sample Data*



If some of your data files overlap, you can bring one set forward in the display by right clicking on the name in the tree view and selecting the "Highlight" option.

Unloading data:

To unload data files from SEABED STATISTICS, right click on the name in the tree view and select the "Remove" option.

ENTERING FIELD SAMPLES TO SEABED STATISTICS

To enter a list of field samples, open the Calibration Points tab of Spreadsheet window and enter your bottom types with approximate E1 and E2 values. In this spreadsheet, the Notes field names the sample; it is not the seabed identification.

FIGURE 8-4. *Entering Calibration Points*

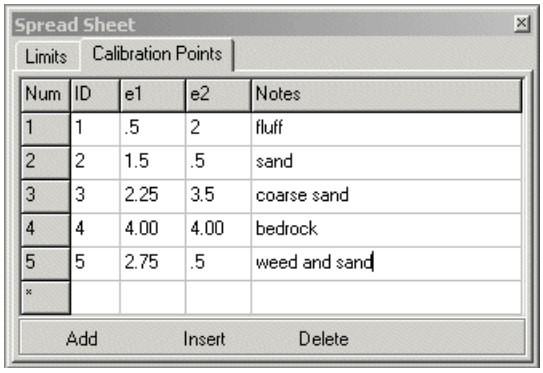
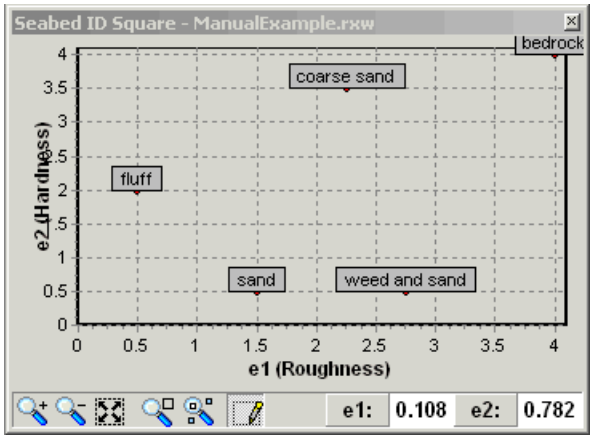


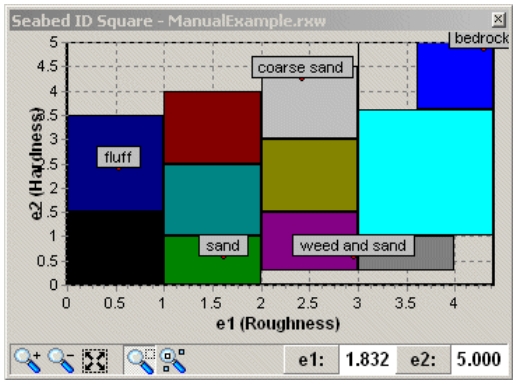
FIGURE 8-5. *A blank Seabed ID Square with Calibration Points displayed*



ENTERING SEABED CLASSIFICATION RANGES IN SEABED STATISTICS

In the previous versions of Seabed Statistics, the defined ranges for the roughness (e1) and hardness (e2) identification were rectangular.

FIGURE 8-6. *Seabed ID Square in Seabed Statistics*



Because the scatter from the roughness and hardness readings on a particular surface are not square, we now support “polygon” ranges to better “fit” the scatter areas.

You can define the ranges using one or both of the following methods.

- **Manually type the information to the Limits tab of the Spreadsheet window**.
  a. **Create a new range name** by pressing the “Add” button on the *left* side of the Spreadsheet window and typing the name into the space created in the spreadsheet.
  b. **Define your range** by pressing the “Add” button on the *right* side of the window, once for each point needed to define your range, then manually entering the hardness/roughness (e1/e2) levels that define the range.

As each classification is defined, the corresponding area will be drawn in the Seabed ID Square window.

FIGURE 8-7. *The Edit Ranges Spreadsheet*

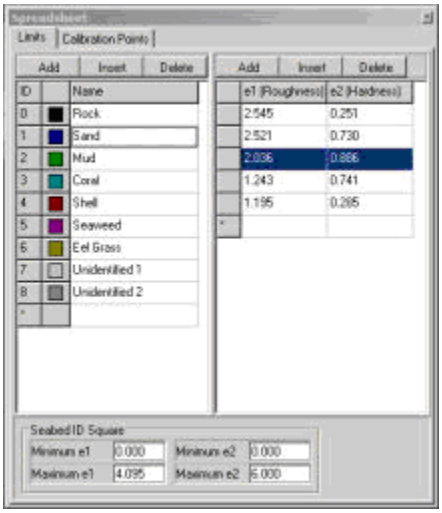
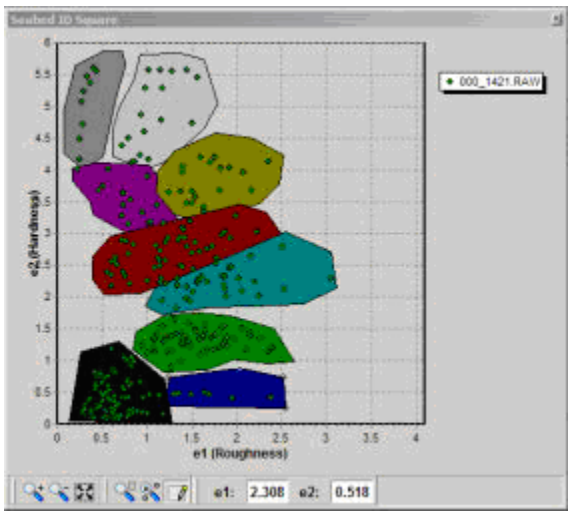


FIGURE 8-8. The resulting Seabed ID Square



- **Use the cursor to draw the ranges** in the Seabed ID Square window.
  a. **Click the Range Edit Icon** on the bottom of the Seabed ID Square window. This will change the cursor to the Range Edit cursor.

  b. **Define the polygon**.
    i. **Press the "Shift" button**. When you press the Shift button the cursor changes to let you know you are adding points. *Keep it pressed as you click all the points in the range perimeter.*

    ii. **Click the points around the perimeter of your polygon**. As you click on the screen the polygon will be built.
    iii. **Close the polygon** by releasing the Shift key.

To create another new range, press the Shift button again and click the points for the new range.

EDITING SEABED SQUARES

As you are developing the Seabed Square for your project area, you may need to modify your settings or add new ranges.

1. **Load the seabed square into SEABED STATISTICS** by selecting FILE-OPEN and choosing the SIX file you wish to edit.
2. **Modify your square**.
   - Define additional ranges.
   - Change your current range settings. You can enter new values in the spreadsheet or use the cursor in the Seabed ID Square window.

To change existing range settings:

1. Select the range.

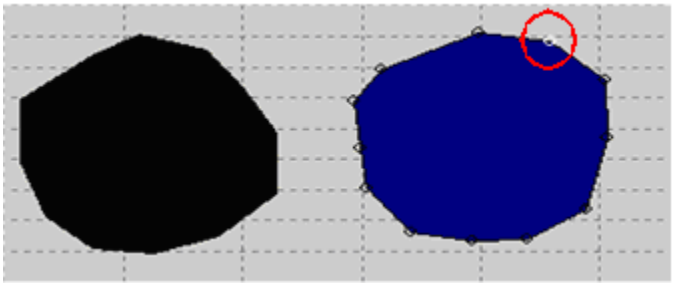
2. When a range is selected, you can add nodes to the border or move the existing nodes.

- "Entering Seabed Classification Ranges in Seabed Statistics" on page 8-185

Selecting a Seabed Range

1. **Enter Range Edit Mode.** (Press the Range Edit Icon.) As you move over an unselected range with the mouse you will see a Range Select cursor.
2. **Click on any range in the Seabed ID Square window.** The cursor will change to the Node Edit Cursor while it is within the selected range and the nodes defining the selected range will be displayed (shown below).

FIGURE 8-9. *The range on the right is selected (active/current range).*



A range can also be selected by clicking on it in the Spreadsheet window.

Adding a Node to the Selected Range

A new node must be added on an existing edge.

1. **Press the Shift key**. (Remember, new points can only be added with the Shift button pressed.)
2. **Move the cursor** (with the Shift key pressed) over an edge of the selected range. You will notice the Node Addition cursor.
3. **Click on the point where you want to add a node on that edge**.

Nodes can also be added by using the Spreadsheet window.

Moving a Node on the Selected Range

To move a node:

- **In the Seabed Square**, move the cursor over a node point on the selected range. When the cursor changes to the Node cursor, click and drag the node to the new position.
- **In the Spreadsheet** by changing the roughness/hardness (e1/e2) values for that node in the Spreadsheet window. When you select a node either by the Node tool or the spreadsheet window, that node is drawn in white (circled in the previous image) on the Seabed ID Square window.

CREATING SEABED STATISTICS

The second function of SEABED STATISTICS is to read and analyze the E1 and E2 values in the survey data you have loaded to the program, then present statistical information about it. **Four windows display the data statistics.**

When you load survey data to SEABED STATISTICS:

- **The file names are listed in the tree view on the left.**
- **The statistics are automatically calculated and displayed.**

Beware!

BEWARE! If you have loaded data files that should not be included in the statistical analysis, you must omit them from your display and statistical calculations by right clicking on the name in the tree view and clearing the "Enable" option.

- **E1 Distribution and E2 Distribution windows:** The distribution of the E1 and E2 values are graphed in the two distribution windows.

FIGURE 8-10. *E1 Distribution Graph*

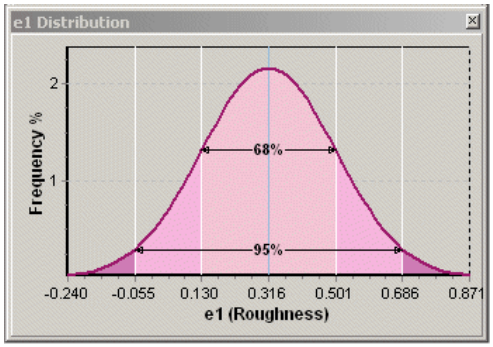
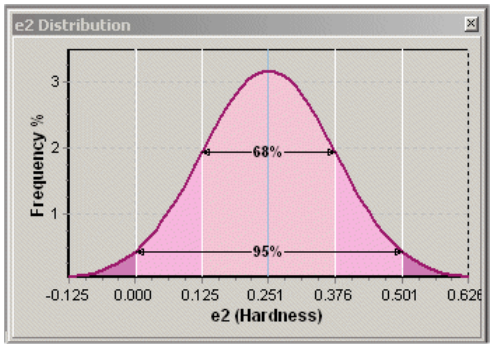


FIGURE 8-11. *E2 Distribution Graph*



- The **Material Statistics** display presents the same data in numeric form.

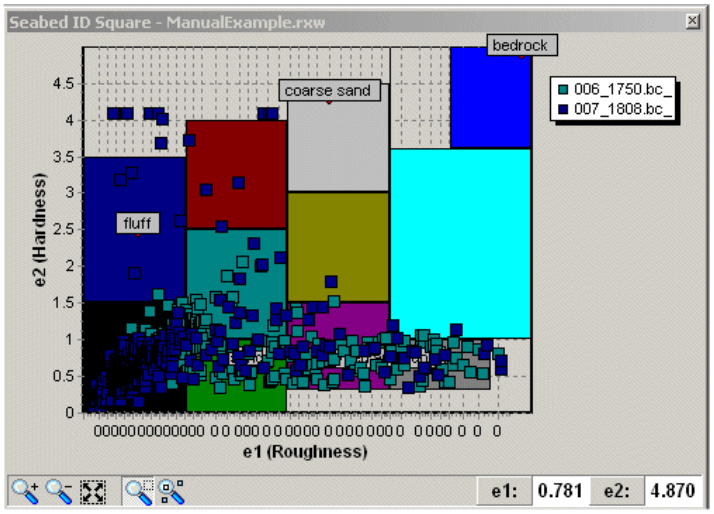
FIGURE 8-12. *Material Statistics*

Material Statistics

	Points	Min	Max	Sigma	-2 Sigma	-1 Sigma	Mean	+1 Sigma	+2 Sigma
e1	1395	0.100	4.090	0.734	-0.741	-0.007	0.727	1.461	2.195
e2	1395	0.090	4.090	0.418	-0.145	0.273	0.691	1.109	1.528

- The **Seabed ID Square** overlays the E1 and E2 data on the classification squares.

FIGURE 8-13. *E1 and E2 overlays the Seabed ID Square*



The tools in the Seabed ID Square window enable you to remove any data from the statistical analysis. You can omit selected data points or entire files from your display and statistical calculations.

To omit select data points:

1. **Click on the Material Selection Icon** (right-most on the toolbar).
2. **Drag an area around the data** you want to remove with your cursor. The selected points will turn white. If you are not satisfied with the selection, you can:
   - **Make a new selection** by dragging a new area.
   - **Deselect the data** by selecting EDIT-CLEAR SELECTION.
3. **Select EDIT-DELETE SELECTED MATERIALS** or hit the Delete key. The Material Statistics and the E1 and E2 Distribution displays will all update accordingly.

To omit entire data files:

Right-click on the name in the tree view and clear the "Enable" option.

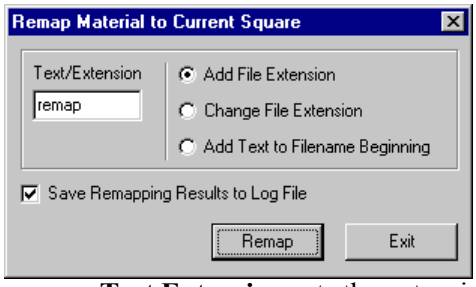
NOTE: This does *not* delete the data from the data files.

REASSIGNING SEABED IDENTIFICATION VALUES

The Seabed Square is used by the SeabedID.dll to assign Seabed Identification values to each sounding record. In SEABED STATISTICS, you can reassign these values based on a different Seabed Square. When you do this, SEABED STATISTICS creates a new set of data files with the modified identification numbers.

1. **Open the new Seabed Square** by selecting FILE-OPEN SEABED ID SQUARE.
2. **Load your sounding files by** selecting FILE-ADD MATERIAL then the Raw or All format files from the file selection dialog.
3. **Select FILE-REMAP MATERIAL**. A dialog will appear with a number of options for naming the remapped files.

FIGURE 8-14. *Seabed Statistics Remap Dialog*



- **Text Extension** sets the extension to be used in naming the files. There are three ways this text can be used. The following table describes each option. The sample names result from using "new" as the text to reassign 041_322.edt which is listed in the FirstOne.log.
  - **Add File Extension** adds a "." followed by your text to the end of your text name. Ex. 041_1322.edt.new, FirstOne.log.new.log
  - **Change File Extension** replaces the original extension with the text. Ex. 041_1322.new, FirstOne.new.log
  - **Add Text to Filename Beginning** begins each file name with your text. Ex. new041_1322.edt, newFirstOne.log
- **Save Remapping Results to Log** File creates a catalog file listing all remapped files**.**

4. **Enter your settings and click [Remap]**. A window will appear with a line-by-line accounting of the conversion and the converted files will be saved to the same folder as the original data files.

EXPORTING FROM SEABED STATISTICS

Once you have configured your seabed square and loaded your survey data to the SEABED STATISTICS program, you can export the

information to formats that may be useful in other modules or outside of HYPACK®.

TABLE 8-1. *SEABED STATISTICS Export Formats*

Seabed Data	Output
Selected Sounding and ID data	Text
Seabed ID Colors	HYPACK® Colors File (*.HCF)
Legend	Graphic (*.BMP)

EXPORTING SEABED DATA TO A TEXT FILE

SEABED STATISTICS can reassign the seabed identification values in your survey data and export selected data to a text file. This does *not* affect the input data files.

For each record, it reads the E1 and E2 values, refers to the currently loaded Seabed Square to determine the ID number and writes the requested information to the exported XYZ file.

Values available for output include the following data:

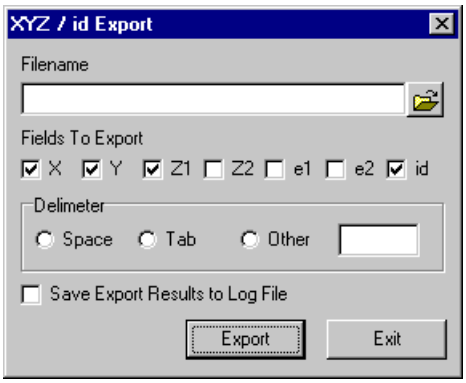
TABLE 8-2. *Output Options from SEABED STATISTICS*

- ID
- X
- Y
- Z1
- Z2
- E1
- E2

To export your seabed data to text:

1. **Load your seabed square.** The identification numbers exported will be based on this square.
2. **Load your edited data files.** The depths, E1 and E2 data will come from these files.
3. **Select FILE-EXPORT MATERIAL** and the XYZ/ID Export dialog will appear for you to choose your export options.

FIGURE 8-15. *XYZ ID Export Dialog*



- **Filename**: Click the File Open icon and define the path and name for the exported file.
- **Fields to Export** provides a series of check boxes, one for each type of data that may be included in the resulting text file. Check those that you wish to export along with the **Delimiter** that will separate each value.

4. **Click [Export]** and the text file will be created according to your choices.

Converting Seabed Identification Colors to Project Colors

You can export your Seabed Identification colors from SEABED STATISTICS to your project colors. By doing this:

- SURVEY can color-code the matrix using Seabed ID colors.
- HYPACK® can display a seabed matrix using seabed colors.

To export your colors:

- **When you save your SIX file**, SEABED STATISTICS asks you if you would like to save the color codes to an HCF file (HYPACK® Color File) and transfer the seabed color coding to the project color settings. The new HCF file will be named *SixFileName*_six.HCF.
- **Select FILE-EXPORT ID SQUARE TO HYPACK® COLOR FILE** and naming the file.

In either case, the new HCF file will be saved to the project directory. When you exit SEABED STATISTICS, it will be implemented in the HYPACK® display.

In order to avoid confusion, a brief explanation about how this works with seabed identification data is in order.

Each cell in a matrix file actually has space in the matrix code for two depths. (This is what allows us to show the survey depth, dredge depth or the difference between the two values in dredge projects.) When you are collecting seabed identification data, the SeabedID device driver stores the seabed identification number in the first memory space, and the depth in the second.

The HCF file normally specifies the color that goes with each depth range. When SEABED STATISTICS exports the seabed colors to the HCF, it saves a range for each seabed identification number (plus and minus 0.5) with its corresponding color. Since the seabed identification numbers are stored in the first "depth" memory, SURVEY reads it as a depth and colors the matrix accordingly.

To display a seabed matrix using Seabed ID colors in HYPACK®:

1. **Load your seabed colors HCF file to your project**.
2. **Right-click on the Matrix folder in the Project Files list and select 'Seabed ID'**.

GENERATING A SEABED LEGEND IN BMP FORMAT

The colors and bottom types defined in a seabed square may be exported to a labeled BMP file. This graphic may then be imported to HYPLOT for use as a legend in the smooth sheet plot.

Once you have loaded the seabed square to SEABED STATISTICS, select FILE-EXPORT ID SQUARE TO IMAGE (Ctrl+I) and name your output file in the dialog that appears. The file will be saved, by default, to the project directory.

SEABED IDENTIFICATION IN MAPPER

If you have an echosounder that provides seabed identification data, you can create a Seabed Identification Square in SEABED STATISTICS then use SEABED MAPPER to:

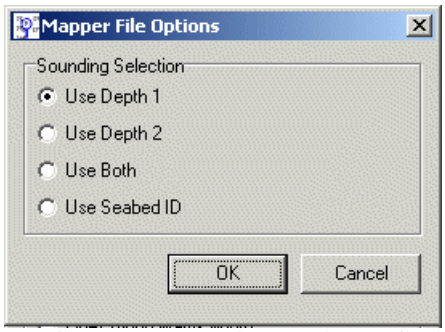
- **Map your seabed identification (seabed ID) colors into a matrix** for display in MAPPER .
- **Export an X, Y, Z, ID file**.

The interface is much the same as MAPPER, but includes the enhancements necessary for the seabed identification features.

1. **Create a Seabed Identification Square** in the SEABED STATISTICS program.
2. **Launch SEABED MAPPER** by selecting UTILITIES-SEABED-SEABED MAPPER.
3. **Load the Seabed Identification Square** by selecting FILE-OPEN SEABED ID SQUARE.
4. **Open your Matrix file and, if it is a filled matrix, the data that should be included.** Set:
   - Load Soundings from Matrix = No
   - Add Soundings to Matrix = Yes and click [Update with Catalog File] to select your files that include the seabed identification information.

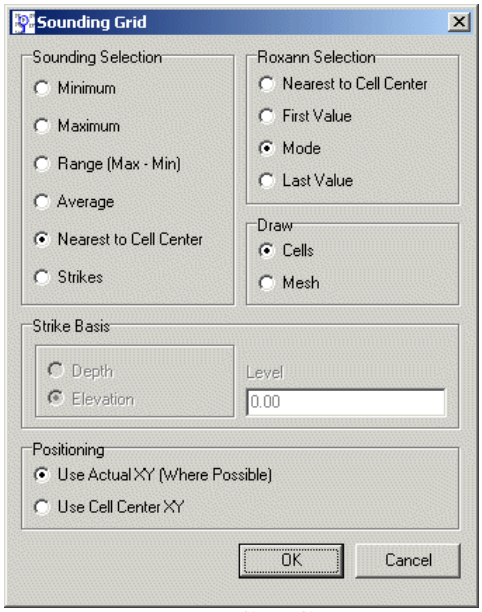
5. **If you have opened an empty matrix, load your soundings** by selecting FILE-LOAD SOUNDINGS and choosing your files that include the seabed identification information.
6. **Set your file options.** SEABED MAPPER includes an additional "Use Seabed ID" option. This tells the program to fill the matrix with seabed ID colors based on the seabed ID information in each record and your seabed ID square, rather than with depth data.

FIGURE 8-16. *SEABED MAPPER File Options*



7. **Set your mapping options**. SEABED MAPPER includes a separate set of Seabed Selection options that are enabled if you have chosen "Use Seabed ID" in the file options.

FIGURE 8-17. *Data Selection Options*



- **Nearest to Cell Center**
- **First Value** in the file positioned in each matrix cell.
- **Last Value** in the file positioned in each matrix cell.
- **Mode** colors the cell according to the Seabed ID that occurs most often within the cell.

8. **Save your results**. SEABED MAPPER can store data in:

- **Matrix files filled with seabed identification colors**. These can be displayed in the HYPACK® window by:
  i. Enabling them in the project files list.
  i. Setting HYPACK® to display seabed identification colors.
  ii. Loading the correct seabed identification square in the Soundings Tab of the HYPACK® Control Panel.
- **X, Y, Z, ID files**.

CROSS CHECK STATISTICS

The STATISTICS program enables you to compute and display the sounding difference between intersecting lines of single beam data. The program provides a statistical report showing the standard deviation distribution and average error. The output report contains detailed information for every intersecting point.

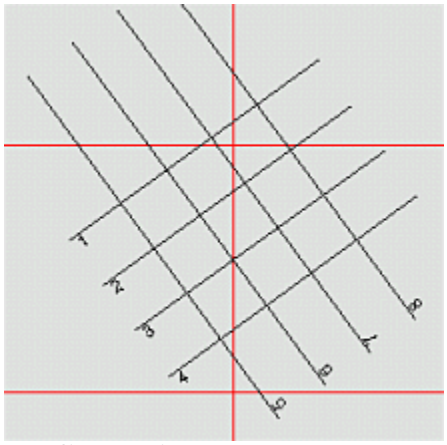
- **High Mean Difference, Low Std. Dev.:** There may be a systemic error that caused all of the check lines to be higher/lower than the normal lines.
- **Low Mean Difference, High Std. Dev.:** This means that you have an equal
- number of values in the check lines that are above and below the mean difference. They average out in the end, but there will be large differences in some intersections.
- **High Mean Difference, High Std. Dev.:** Time to stop the survey and figure out where you're going wrong.
- **Low Mean Difference, Low Std. Dev.:** Optimal results. Good job!

RUNNING THE STATISTICS PROGRAM

1. **Create Planned Lines to cover your survey area.** It is easiest to create 2 sets of lines that each cover your survey area and that run perpendicular to each other.

   NOTE: The statistics are calculated based on the intersection of these lines, regardless of how accurately your survey data follows them.

FIGURE 8-1. *Sample Planned Lines*



2. **Collect single beam survey data along each line.** The files may be:

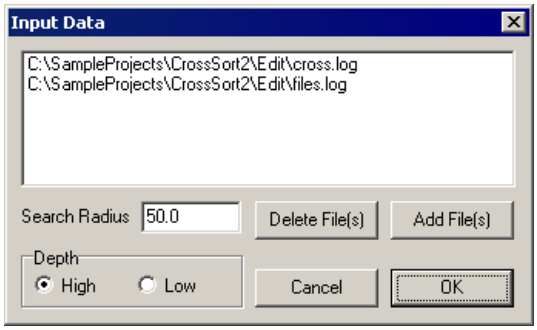
- **Divided into two log files**, one for section lines and one for cross lines. The program runs faster if the section lines and cross lines are assigned to separate catalog files.
- **Listed in one catalog file**.

3. **Start the STATISTICS program** by clicking UTILITIES-STATISTICS.
4. **Open the Input dialog** by clicking the Open Files icon. The Input dialog will appear.
5. **Fill the Input dialog and click [OK].** The program will calculate the statistics and show the your results on your screen.
   a. **Enter your Input files** by clicking on the corresponding button and choosing them in the File Select dialog. The Input Info dialog requires one or two Catalog (*.log) files. Each file should be entered (with their path) in the corresponding field. (The program will work properly even if the places for section and cross lines are reversed.)
   If all files are listed in one catalog file, it is placed in the Section File field while the Cross Line File field is left empty. The program will proceed using only the lines in the Section File.

   NOTE: The LOG files and the Output file must all reside in the same directory.

   b. **Set the Search Radius**--the distance from the intersection point of the planned lines that the program will search for intersecting data. A smaller search radius makes the program execute faster, but choosing too small a search radius will cause you to miss intersection points.

FIGURE 8-2. *Input Information Dialog*

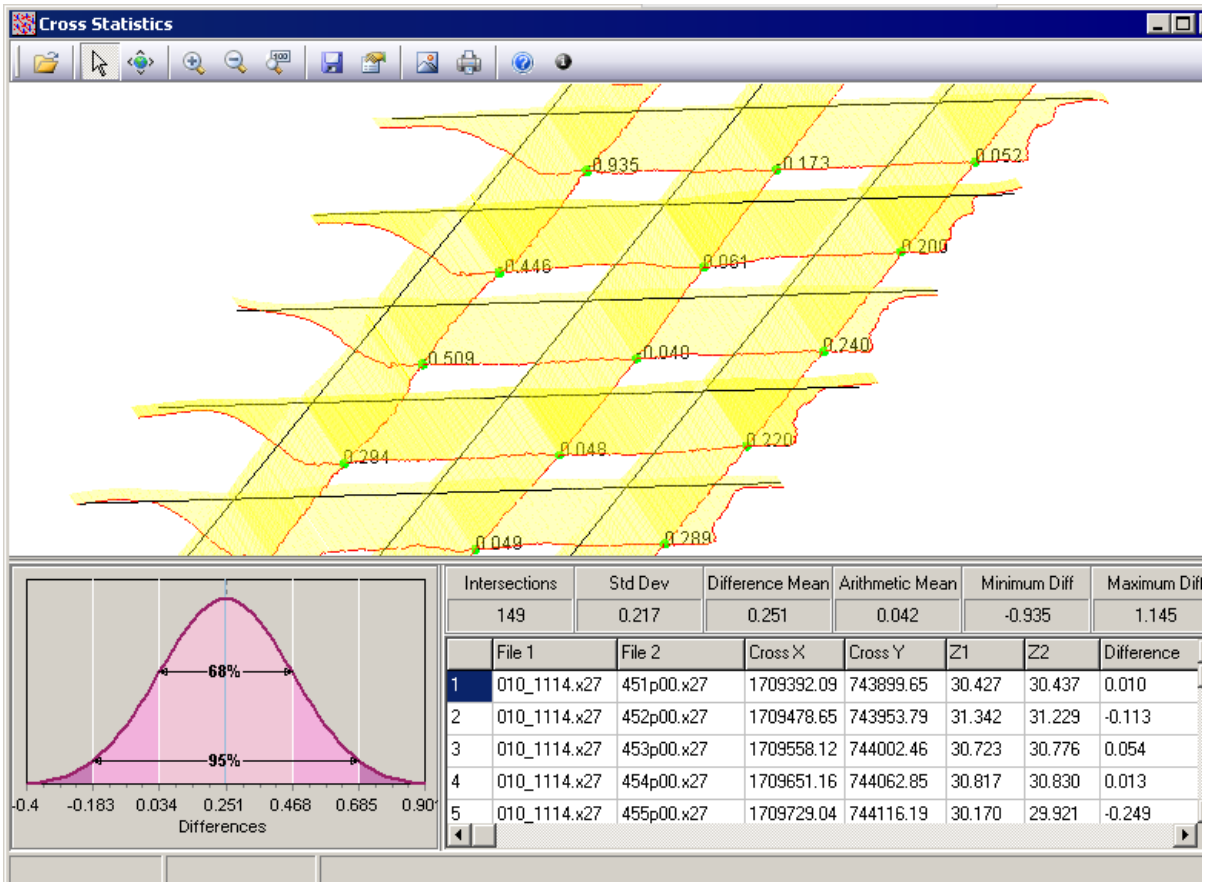


   c. **Click [OK]** and the program displays the depth differences between each pair of survey lines that meet the search criteria.

   For each pair of lines, the program interpolates a sounding value at the intersection point and takes the difference between these values for this intersection. Once it has computed all of the intersection values, it runs statistics on all the values to calculate the mean difference and standard deviation. The results are shown in multiple formats:

- In a graphical display
- In a statisical distribution graph
- In a spreadsheet of all intersections.

FIGURE 8-3. *Graphical display of the Cross Statistics*

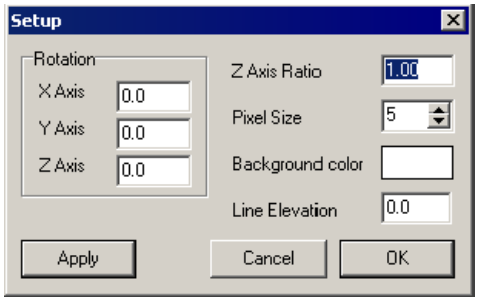


6. **Save your report. (Optional)**
   - **To save the statistics to a spreadsheet**, click the 'Save Report to File' icon and provide a name for the Microsoft® Excel® file that will be generated.
   - **To save the statistics graphic,** click the 'Export to Bitmap' icon. The Windows® printer window appears for you to send it to the printer.
   - **To print the statistics report,** click the 'Print' icon. The Windows® printer window appears for you to send it to your printer.

VIEW OPTIONS IN THE STATISTICS PROGRAM

You can adjust the viewing perspective of the graphic display by clicking the 'Properties' icon. The Setup dialog will appear.

FIGURE 8-4. Setup View Dialog



The **Rotation angles** turn the graphic in all directions.

The **Z-Axis ratio** stretches or shrinks data along Z axis to achieve better view. Choosing negative values allows you to invert data along Z-axis.

Pixel Size will change the size of the soundings on the intersections.

Background Color will change the background color in the data view window.

Line Elevation: Level where the planned lines are drawn in the Statistics diagram. This can be helpful to bring the planned lines closer to the data level.

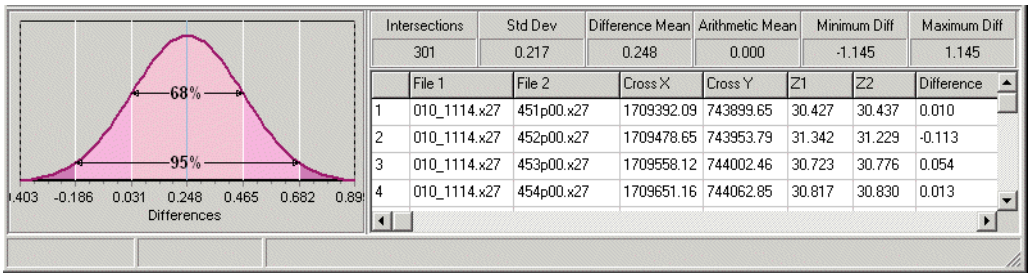
A series of icons and mouse actions further control your view.

Action	Icon	Mouse Action
Zoom functions	Zoom In Zoom Out Zoom Extents	Mouse wheel
Rotate		Left drag
Pan		Right drag
Reset Center	Recenter	

CROSS CHECK STATISTICS REPORT

Once you load your data files, the statistics are automatically calculated and displayed.

FIGURE 8-5. *Sample Statistics Report Display*



Intersections	Std Dev	Difference Mean	Arithmetic Mean	Minimum Diff	Maximum Diff
301	0.217	0.248	0.000	-1.145	1.145

	File 1	File 2	Cross X	Cross Y	Z1	Z2	Difference
1	010_1114.x27	451p00.x27	1709392.09	743899.65	30.427	30.437	0.010
2	010_1114.x27	452p00.x27	1709478.65	743953.79	31.342	31.229	-0.113
3	010_1114.x27	453p00.x27	1709558.12	744002.46	30.723	30.776	0.054
4	010_1114.x27	454p00.x27	1709651.16	744062.85	30.817	30.830	0.013

- **Data Set Statistics:** Arithmetic Mean, Difference Mean and Standard Deviation are calculated using well-known statistical formulas. They are included, with other statistics about your data set, in the display.
- The **standard deviation chart** shows the mean absolute difference and the differences out to +/1 3Σ.
- The **spreadsheet** lists each line pair that intersects, the XY position of the intersection, the depth values of each line at that position and the vertical difference.
  - **Positive differences** show that File 1 data is above File 2 data.
  - **Negative differences** show that File 1 data is below File 2 data.

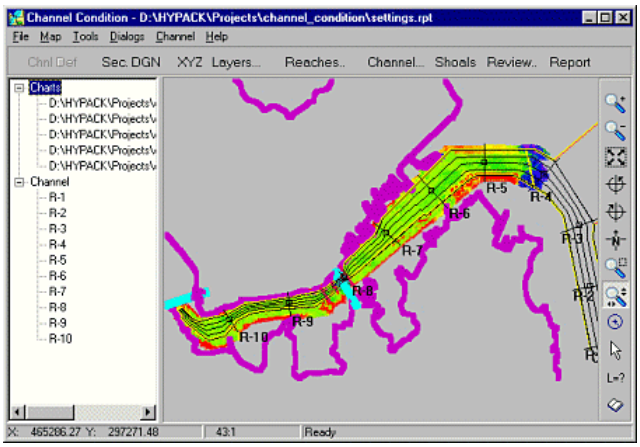
CHANNEL CONDITION REPORTER

The USACE_RPT program is special utility developed for USACE-New England District, which automatically generates Channel Condition reports.

CHANNEL CONDITION REPORTER INTERFACE

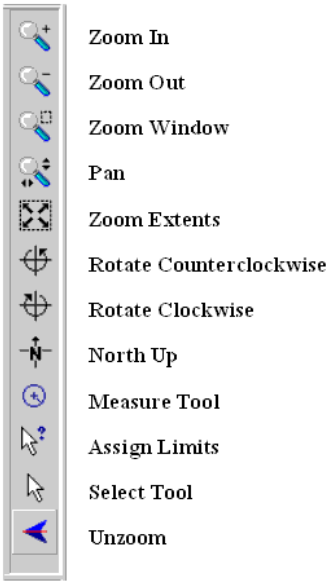
Load the program by selecting UTILITIES-FILE WORK-OTHER-CHANNEL CONDITION REPORTER. The screen will contain a blank screen with a menu (top), the Object Editor (on the left) and a tool bar (on the right).

FIGURE 8-1. *Channel Condition Reporter*



The **Tool bar** assists you in navigating the screen when you have objects displayed.

FIGURE 8-2. *CHANNEL CONDIITON REPORTER Toolbar*



The **Measure Tool** can be used to measure the distance and azimuth between two points in the area map. Just click the Measure Tool icon then click and drag between the two points on the map.

Unzoom can undo the last 20 zoom commands.

The cursor position and zoom ratio is displayed in the status bar.

To access the Object Editor: **Click on the book icon.** The Object Editor lists all charts and reaches that have been loaded to the project.

To unload any chart: **Right-click the chart in the Object Editor and select 'Unload Chart'.**

RUNNING THE CHANNEL CONDITION REPORTER PROGRAM

1. **Start Channel Condition Reporter and open a project.** Select FILE-NEW for a new project. (Use FILE-OPEN PROJECT SETTINGS for existing projects.)
2. **Create your Channels.**
3. **Set your Channel Properties.**
4. **Create your Reaches.**
5. **Save your Channel and Reach settings.**
6. **Load your Sounding Data.**
7. **Determine your Shoal Data.**
8. **Preview your results.**
9. **Generate your report.**

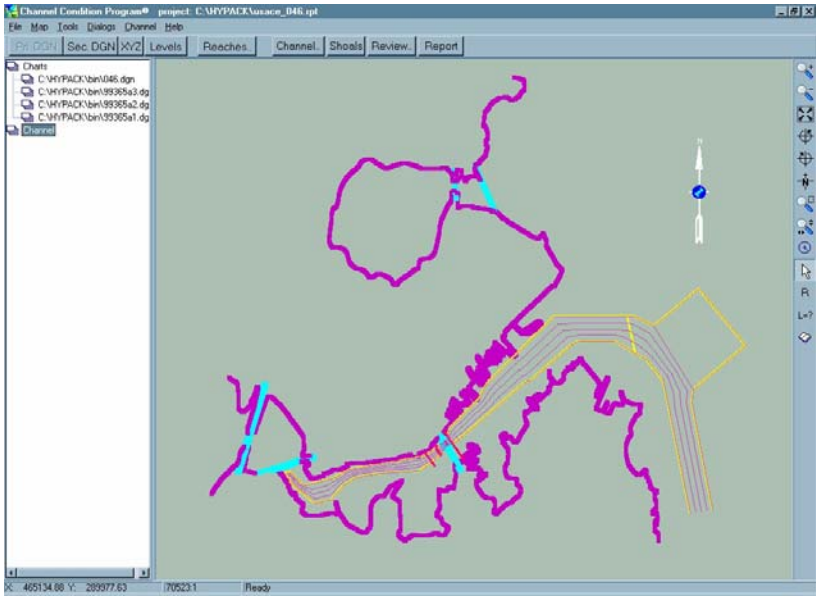
DEFINING A CHANNEL IN CHANNEL CONDITION REPORTER

1. **Load a channel definition file into the project** by selecting DIALOGS-CHANNEL DEFINITION (or clicking [CHNL DEF]) and entering the name of your file. A channel definition file may be either of the following:
   - A DXF or DGN v7 with, at minimum, the following items:
     - A closed polygon which represents the outer limits of your channel.
     - A 3-D polylines which represent, at minimum, the center line and top-of-banks for your channel.
   - An LNW with lines defining, at minimum, the center line, and top-of-banks.

   NOTE: If you want to report separate shoal depths for the side slope and center channel regions, your channel definition file must also define the toe lines.

When you first load your channel definition file to the screen, the program may do a poor job zooming on the contents. You can use the Zoom Window tool to click and drag around your area until it is an appropriate size.

FIGURE 8-3. *Primary DGN Loaded to the Project*

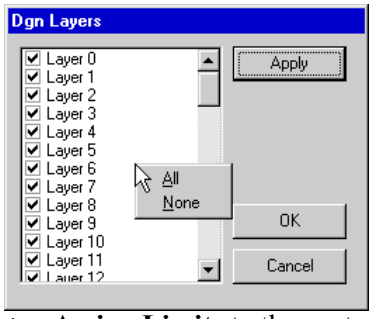


2. **An additional background chart is an optional file that may be loaded to enhance the on screen display**. It does not affect the report. Select DIALOGS-BACKGROUND CHARTS and choose the file.
3. **If are using a DGN file for your Channel Definition file**, select the layers for display. Right-click on the chart name in the Object Editor

and select DGN LAYERS. A dialog will appear listing the layers in the chart. Check the boxes for any layer you wish to include. (Right-click in the list area and use the pop-up menu selections to check **All** or **None** of the boxes.) [Apply] lets you preview the results of your selections in the map view.

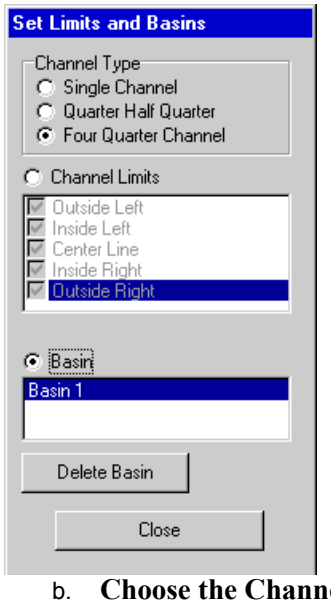
NOTE: This feature is not available for DXF files; it's all or nothing for them.

FIGURE 8-4. *DGN Layer Control Dialog*



4. **Assign Limits** to the center line, and inside and outside lines on each side of center.
   a. **Select TOOLS-ASSIGN LIMITS** or the Assign Limits icon and a dialog will appear.

FIGURE 8-5. *Assign Limits Dialog*



   b. **Choose the Channel Type**.
      - **Single Channel** generates a report of information across the entire channel.

- **Quarter Half Quarter** divides the channel longitudinally into 3 divisions (outside left quarter, inside half, outside right quarter) and presents the data by division.
- **Four Quarter** does the same with four divisions.

c. **Define your channel.**

i. **Select "Channel Limits".**

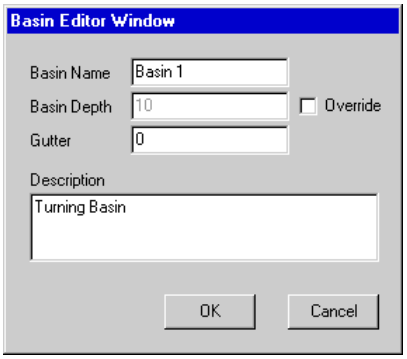
ii. **One at a time, select one of the lines in the dialog to be defined then click on the corresponding line in the map**. The selected line will change color until you select another line in the dialog.

NOTE: To determine the left and right sides of the channel, imagine that you are standing at the beginning of the center line looking down the channel. Be sure these are defined accurately. If you are unsure, take your best guess, then create your reaches. The first reach divider will appear at the beginning of the center line. If you assigned the limits incorrectly, start over and reverse your lefts and rights.

It may be easier to accurately select the lines in the map if you have turned off the display of other layers, even if only temporarily, in the Layer Control dialog.

5. **If your channel includes a turning basin**, select "Turning Basin" then click on the basin line on the chart. The Basin Editor will appear. Enter your settings and click [OK].

FIGURE 8-6. *Basin Editor*



The **Basin Name** is used in the Object Editor's file list.

You can check "**Override**" and set a **Basin Depth** different than the Channel Depth.

The **Gutter** creates lines at a user-specified distance inside the basin perimeter. If a gutter is created, the report generated will exclude the data in these zones from the available depths for the channel. The shoalest depths will be footnoted in the report, but they will not be recognized as controlling depths. Excluding the distance along the

shore acknowledges and defines sloping banks, and focuses the report on the center navigable area.

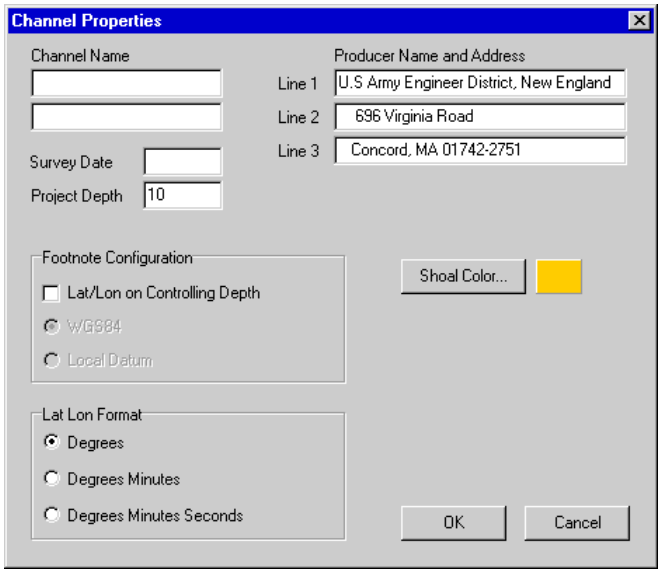
NOTE: At a later time, you can access this dialog to modify these settings by right clicking the Basin Name in the Object Editor and selecting "Properties".

6. **Create the Channel**. When all of the lines have been assigned, click on [Close] to exit the dialog and store the information.

SETTING YOUR CHANNEL PROPERTIES IN CHANNEL CONDITION REPORTER

Enter the Channel Properties by selecting CHANNEL-PROPERTIES or clicking [Channel]. The Channel Properties dialog will appear.

FIGURE 8-7. *Channel Properties Dialog*



The **Channel Name** can be any name you choose with 2 lines available.

Producer Name and Address is included in the header of the final report.

The **Survey Date** represents the day(s) when you conducted the survey upon which the report is based.

The **Project Depth** is assigned to the entire channel. You can "over-ride" this value for an individual reach by right-clicking on the Reach name on the map and selecting PROPERTIES. A dialog will be displayed in which you may edit the settings for that reach.

Footnote Configuration: Footnotes list soundings excluded from the available depths for the channel by any Outer Left and Outer Right Distances set in the Reach Properties. The minimum footnote includes the

excluded depth and its distance from the left or right channel limit. You can choose to also include the sounding's lat./lon. position in either **WGS84** or using **local grid** coordinates presented in your choice of three **Lat./Lon. Formats.**

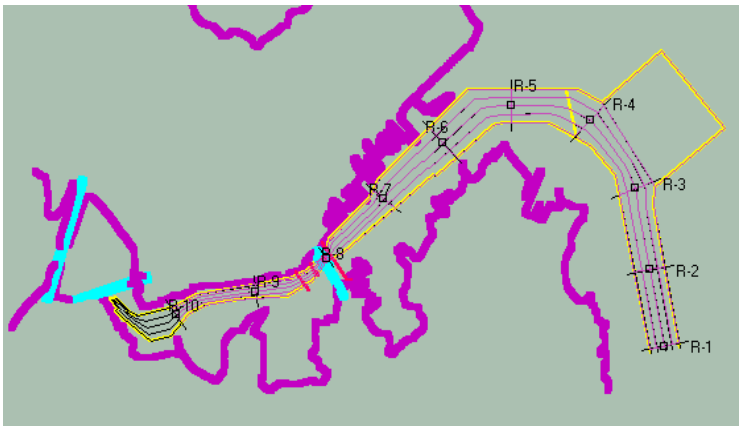
The **Shoal Color** displays the current color for the shoal soundings display. Click [Shoal Color…] to set a different color.

Creating your Reaches in Channel Condition Reporter

You can divide the channel into any number of reaches. Each reach will be presented with a separate set of statistics in the Channel Conditions Report.

1. **Select DIALOGS-MULTIPLE REACHES** (or click [Reaches]) and a dialog will appear.
2. **Define either the number of reaches you want, or the distance a reach covers**.
3. **Click [OK]** and dividers will be drawn across the channel accordingly.

FIGURE 8-8. *Reaches displayed along the channel*



The properties of each reach will default to the channel property settings, but they may be edited through the Reach Editor.

Insert additional dividers by selecting the Reach Tool and clicking at the position in the channel where you want the new divider.

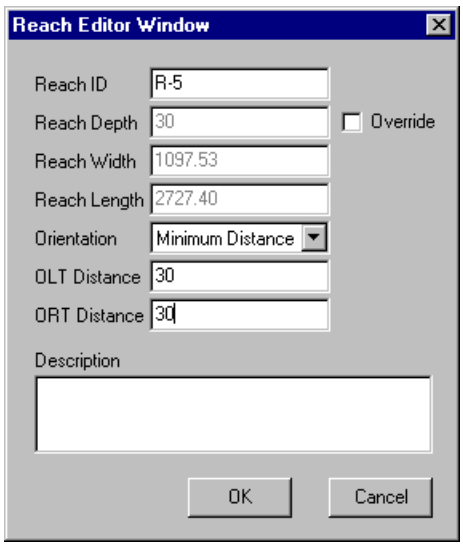
Delete a divider by right clicking on the handle of the divider and selecting Delete Divider. The remaining dividers will not be renumbered.

Reposition a divider by clicking and dragging the handle in the center of the divider.

Setting Reach Properties in Channel Condition Reporter

Right-click on a reach handle (or on the reach title in the list on the left) and select "Properties". The Reach Editor will appear.

FIGURE 8-9. *Reach Editor*



Reach ID specifies which divider is described. You can change the name if you wish.

Reach Depth displays the channel depth from that divider to the next. Check **Override** to enable a change in the *depth for that segment only* and type in the new depth.

Reach Width and **Length** are displayed, but may not be edited.

Orientation offers 3 choices:

- **Minimum Distance** positions the divider at the angle where it crosses the shortest distance between the outside left and right lines of the channel.
- **Perpendicular** positions the divider perpendicular to the outside lines.
- **Set Angle** enables you to set the angle at which the divider crosses the channel.

NOTE: The divider must cross the outer left and right sides. If the orientation entered does not allow this, the divider orientation will not change.

OLT (Outer Left) and ORT (Outer Right) Distances may be specified for each reach. This option creates longitudinal lines at the specified distances, parallel to the left and right toe lines respectively. If these are created, the report generated will exclude the data in these zones from the available depths for the channel. The shoalest depth in these zones, if less than project depth, will be footnoted in your final report. (They will be totally excluded from the Segment Review.) Excluding the distance along the shore acknowledges and defines sloping banks, and focuses the report on the center navigable area.

Saving Your Channel and Reach Settings in Channel Condition Reporter

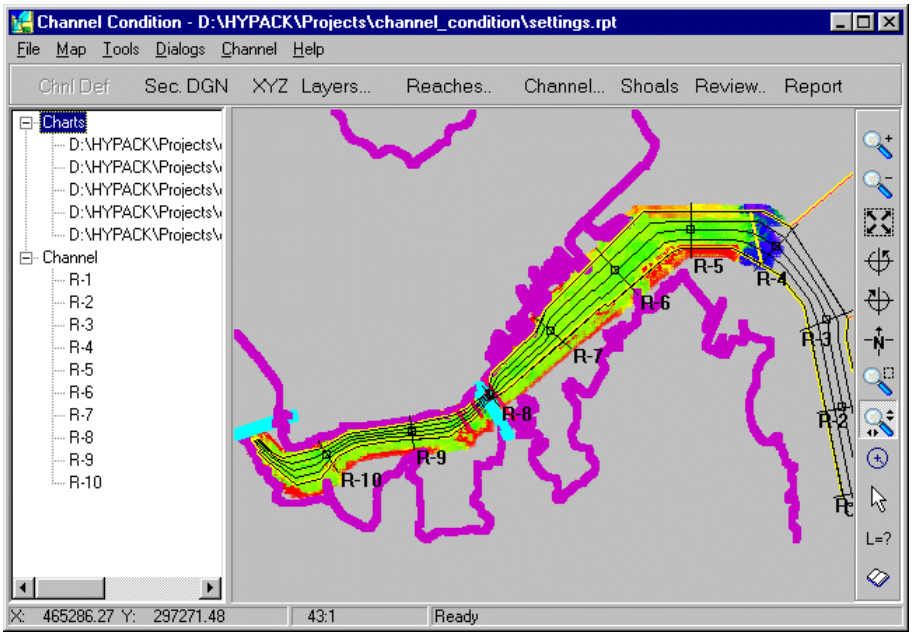
Save your Settings by selecting FILE-SAVE PROJECT or FILE-SAVE PROJECT AS and naming your file. The information you have set so far will be saved with an .RPT extension. For future reports for this same channel, you can save time by selecting FILE-OPEN PROJECT and select the RPT file to get to this point in the process.

Loading Your Soundings Data in Channel Condition Reporter

Load your Soundings data file. Select DIALOGS-LOAD SOUNDINGS (or click [XYZ], select Load Soundings) and select your file. The CHANNEL CONDITIONS program supports the use of either a HYPACK® XYZ file or a DGN version 7 file. Typically, this file will be a sorted HYPACK® File. All of the soundings in the file will be drawn to the screen without regard to overwrites.

NOTE: Soundings are not saved when you exit CHANNEL CONDITIONS REPORTER. Even if the project settings are saved, the soundings must be reloaded each time you re-open the project in the program.

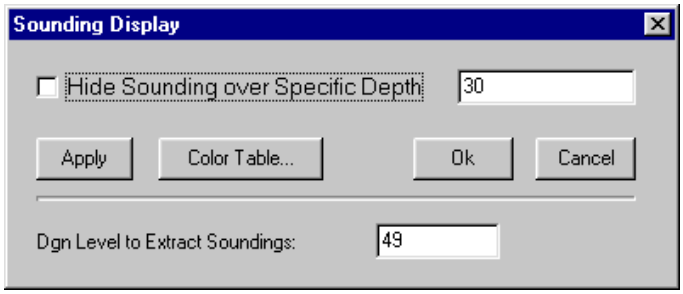
FIGURE 8-10. *Soundings Loaded to the project*



Sounding Display Settings

Display settings are defined in the Sounding Display dialog. Select DIALOGS-SOUNDINGS-SOUNDING DISPLAY (or click [XYZ] and select Sounding Display) and the Sounding Display dialog will appear.

FIGURE 8-11. *Sounding Display Dialog*



To omit larger soundings, check the box and specify the depth limit. Soundings larger than this value will not be displayed.

Change sounding colors by clicking **[Color Table]** and defining the range, increment and color scheme.

[Apply] allows you to preview the effect of your changes on the sounding display before leaving the dialog. Color changes made here will remain in effect for your project when you close the CHANNEL CONDITION REPORTER.

If you have loaded soundings in DGN format, define which layer of your DGN file to display under 'DGN Layer to Extract Soundings'.

NOTE Though the Sounding files must always be reloaded when you re-enter a project in this program, the display settings from the Sounding Display Options dialog are saved with the project settings. If changes are made in the sounding display options, you should save the project settings before exiting the program.

Inverting Depths in the Channel Condition Reporter

If your file is XY(-Z), invert the depths.

1. **Load the soundings file**.
2. **Double-click on the "Charts" item** in the Object Editor to expand the tree view.
3. **Right-click on the name of the XYZ file**.
4. **Click "Invert Depths"** to negate all to the depths.

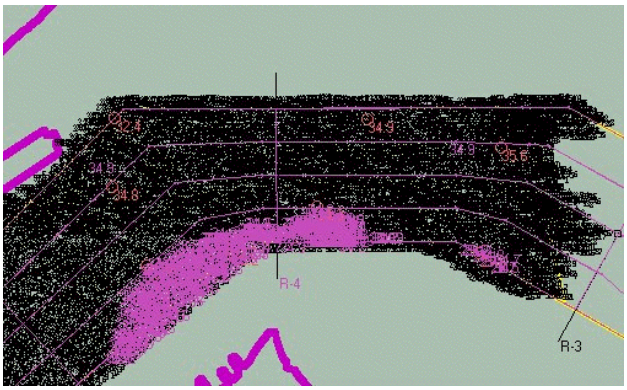
Determining your Shoal Data in Channel Condition Reporter

Click on [Shoals]. The program will go through the Soundings file and determine the minimum depth in each reach and any other shoals that are less than the project depth as specified in the Properties window.

On the screen display you'll see different colored depths.

- **Red** = Controlling Depth
- **Yellow** = Shoals, deeper than the Controlling Depth, but shoaler than Project Depth. You can choose another in the Channel Properties dialog.
- **Blue** = These soundings would have been a Controlling Depth, but it lies in an OLT or ORT zone.

FIGURE 8-12. *Shoals Display*



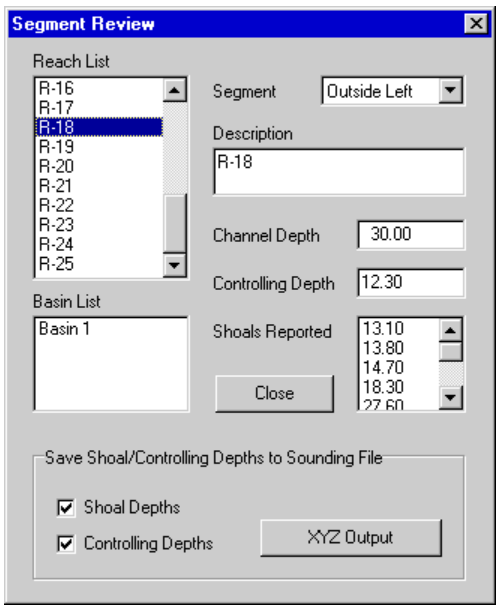
PREVIEWING YOUR RESULTS IN CHANNEL CONDITION REPORTER

Preview your report by segments (optional). The results may be viewed, one reach at a time, by clicking [Review]. The Segment Review dialog appears. Select the Reach and, unless you have chosen the single Channel Type, the segment you want. The description, controlling shoal and additional shoals in the defined area will be displayed.

Export your Shoal Depths or your Controlling Depths (or both) to an XYZ format file. Just check the corresponding box or boxes and click [XYZ Output]. Name the output file in the dialog presented and it will be saved by default to the Sort directory of your project. You can view these depths later in the main window by enabling the output file in the Sorted files list.

Since the XYZ output file does not distinguish between the Controlling Depths and the Shoal Depths, you may wish to export one set of depths at a time so they may be loaded separately for viewing in the main window.

FIGURE 8-13. *Segment Review Dialog*



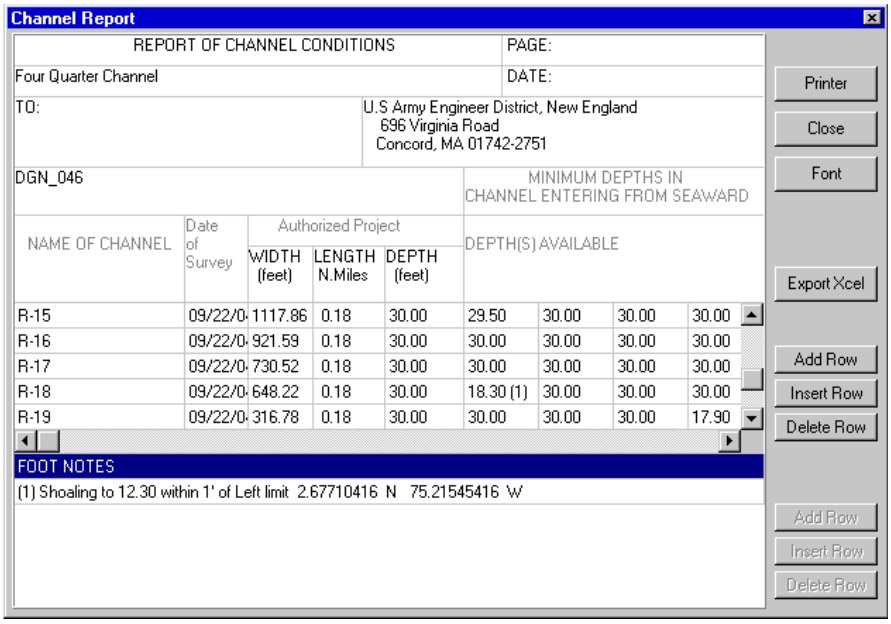
GENERATING YOUR REPORTS IN CHANNEL CONDITION REPORTER

Generate your report by clicking [Report] and selecting "screen" or "text file". This option generates the ER-1130-2-416 Channel Condition Report. Most is self-explanatory. The Depths Available represent the controlling depths of each channel segment.

NOTE: Any Controlling Depths greater than the Project Depth will be reported as the Project Depth.

You may edit any field in the report. The rows may be adjusted in the spreadsheet using the corresponding buttons. [Printer] and [Font], display Windows® Font and Print dialogs to perform each of those functions.

FIGURE 8-14. *A Sample Report Printed to the Screen*



If you have MicroSoft™ Excel installed on your computer, you can export this report to an Excel spreadsheet by clicking **[Export Xcel]**. The Channel Condition Reporter will launch a copy of Excel and export the report data directly into a new worksheet.

CLOUD

CLOUD creates 3-dimensional displays of your survey data, representing each sounding with a pixel, color-coded according to your project's sounding colors and positioned in the model according to its XYZ coordinates. The number of soundings and the minimum and maximum Z value in the data set are listed in the status bar.

This model can be used for the following functions:

- **Creating three-dimensional displays of soundings.** The CLOUD display is much easier and faster to manipulate than a TIN MODEL.
- **Measuring relative position of two points.**
- **Simple editing of your data.** CLOUD enables you to select and remove individual points or blocks of data and save the results in XYZ format. If you load an HS2 file, you may also save your edited results to HS2 format.
- **Generating geo-referenced TIF charts or simple screen captures**
- **Printing or plotting models**.

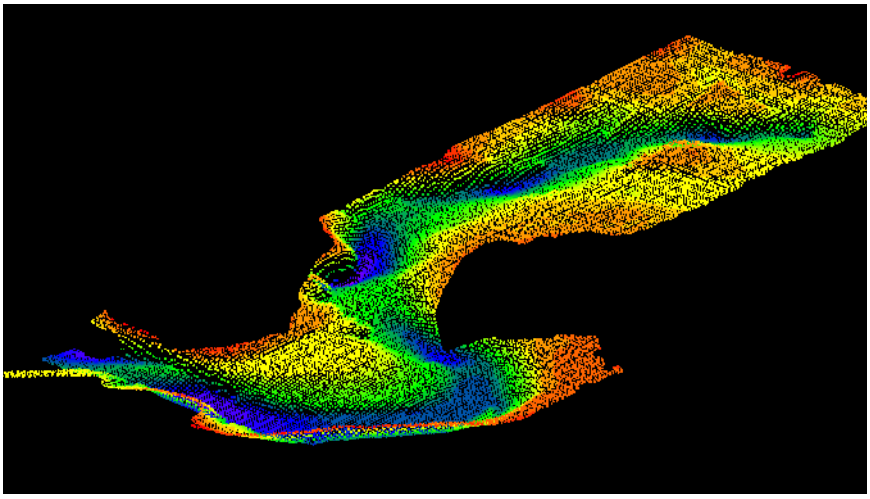
DISPLAYING YOUR DATA IN CLOUD

Displaying your data in CLOUD is as easy as loading your data and choosing the best view options for your data set.

LOADING YOUR DATA IN CLOUD

1. **Start the CLOUD program** by selecting FINAL PRODUCTS-CLOUD from the menu. The CLOUD shell will appear.
2. **Select FILE-OPEN** and select the data you wish to model. CLOUD models data from one or more XYZ data, matrix files (*.MTX), edited HS2 or ALL format files.
   - **To load multiple ALL format or HS2 files**, enter a catalog (*LOG) file of your required files.
   - **To load multiple XYZ files**, select them at once in the File Open dialog.
   - **To load multiple matrix files** select them at once in the File Open dialog.

FIGURE 8-1. *Sample Data in CLOUD - Pixel Display*



VIEW OPTIONS IN CLOUD

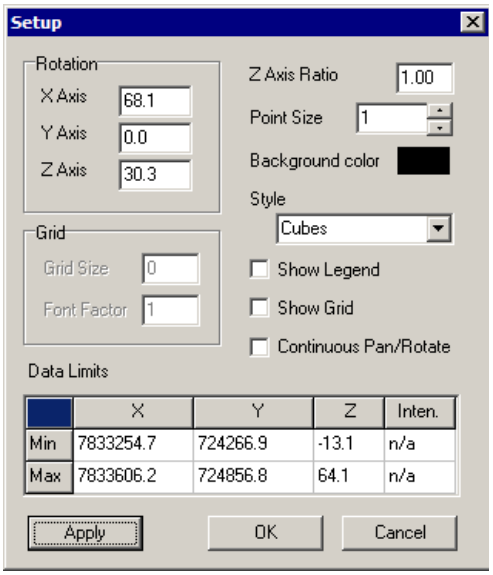
A series of keyboard and mouse commands, as well as the Control Panel and HYPACK® Files options enable you to adjust the display for optimal viewing.

Control Panel Options

To access the view options in the Control Panel:

1. **Click on the Setup Icon**. The Control Panel includes display settings as follows:

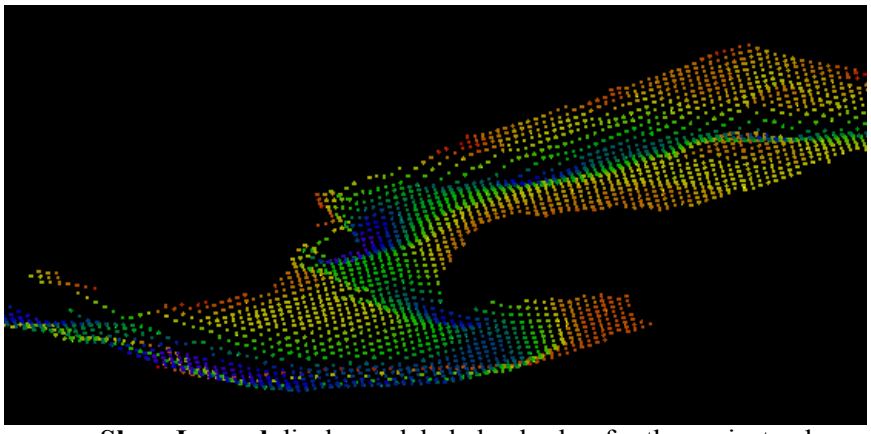
FIGURE 8-2. *CLOUD Control Panel*



- **Rotation** options enable you to turn and view the data from any direction by entering degree values in one or more of these fields.

- **Z-Axis Ratio** enables vertical exaggeration or understatement. A value of 1 draws the data as it appears in the file. A value greater than 1 exaggerates the vertical scale, while a value between 0 and 1 decreases the vertical scale.
- **Pixel Size**: The size, in pixels, each sounding appears.
- **Background Color** enables you to choose the color displayed behind your data files.
- **Style:** Choose Pixels or Cubes. The Cube option also enables the light controls which enable you to shine a virtual light across the sounding contours to enhance the 3-dimensional effect.

FIGURE 8-3. *Sample Data in CLOUD - Cube Display*



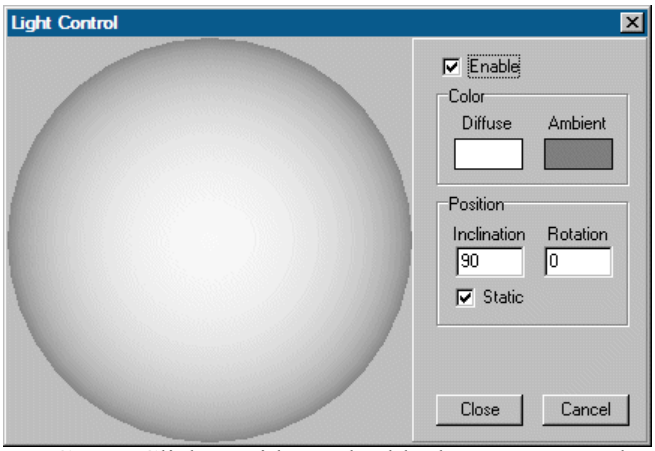
- **Show Legend** displays a labeled color bar for the project color settings. The Colors icon enables you to access the Colors dialog and modify your project colors through the Cloud interface.
- **Show Grid** overlays a grid or grids in the display according to the user-defined grid and font sizes and the grid settings in the HYPACK® Control Panel.
- **Continuous Pan/Rotate:** Drag your cursor across the display and the model will begin to rotate according to the speed and direction of your stroke. It will continue rotating until you use your cursor again.
  - **To change the direction, speed or both,** drag the cursor across the model in a different direction or speed (or both).
  - **To stop the motion,** click on the model to stop the motion.
- **Data Limits** is not a setting. It is only a display of the current data set's minimum and maximum values in each direction.

2. **If you have selected the cube style option, set your lighting options.**

   The **Light Icon** launches the light control where you can enable/disable the light feature, and set the color and position of your lighting for optimal viewing of your model.

If the '**Enabled'** box is checked, the lighting in the Light Control, as well as in your model window will update according to each setting change.

FIGURE 8-4. *Light Control*



Color: Click on either color block to access a color dialog where you can select your favorite color for each option.

- **Diffuse** color comes from the light source.
- **Ambient** sets the color of the light that brightens the entire display. It is similar to the brightness setting in your favorite graphics program.

Position:

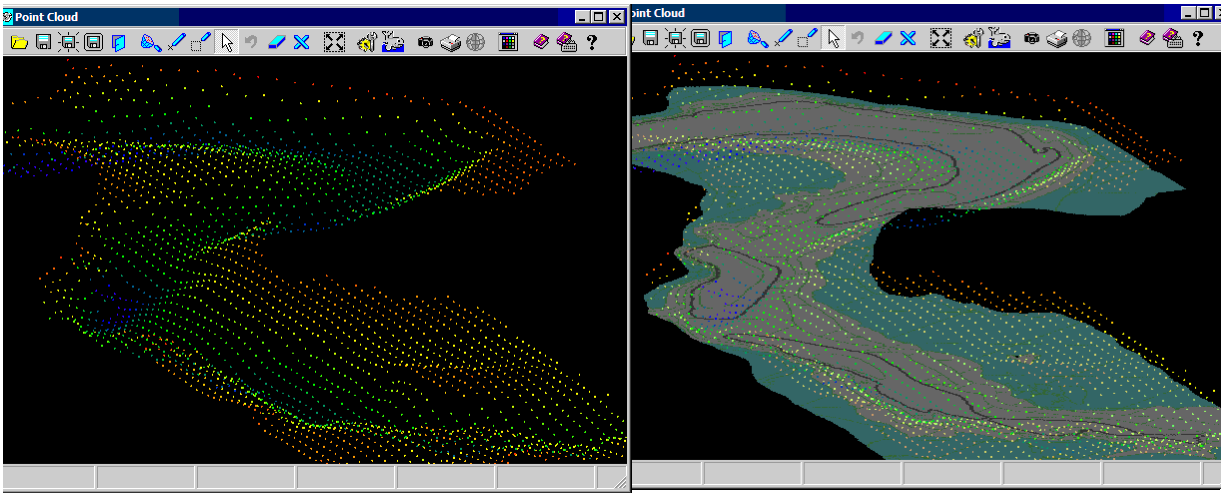
- **Inclination** is the angle of the light relative to the horizon.
- **Rotation** is the position around the Z-axis of the model.
- Together they describe the exact position of the light source relative to the model.

Rather than puzzling out what the angles should be, you can imagine that the shape on the left is your TIN model then uses your cursor to click where you would like the light source to be positioned relative to your model.

3. **Preview your results** by clicking [Apply]
4. When you are satisfied, **click [OK]**.

In addition to the data you are editing, you may display certain other project files such as background charts to provide additional context to your work.

FIGURE 8-5. Cloud Data Only (left), With Background Chart (right)



Displaying Cursor Coorinates

To display the cursor coordinates in the status bar:

Click the 'Show XYZ' icon and place the cursor over the position in question**.**

Displaying HYPACK® Files

To display HYPACK® files:

1. **Click the HYPACK® files icon**. A dialog will appear with a list of additional files you may display.
2. **Check those you wish to display**.
3. **Set the degree of transparency** for those items using the slider.
4. **Preview your results** by clicking [Apply]
5. When you are satisfied, **click [Exit].**

NOTE: The grid here is different than the one specified in the Control Panel. It displays in XY or Lat/Lon (or both) according to the configuration in the HYPACK® Control Panel.

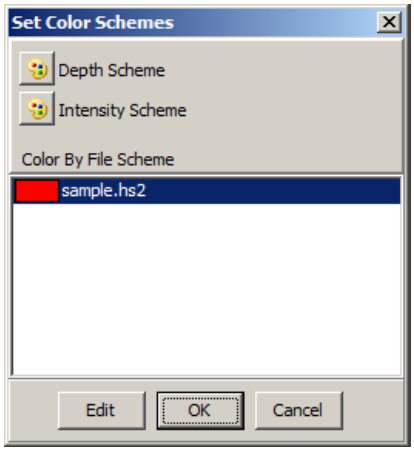
Color Configurations

You can set CLOUD to color-code your soundings based on your choice of the following values:

- **Depth**
- **File**: (Assign a color for each file loaded, regardless of depth.)
- **Intensity**: This color set is applied to HS2 files only. Files of other formats will be colored by depth.

1. **Load your data files to CLOUD**.
2. **Click the Colors icon to access the CLOUD Colors dialog and define a set of colors for each value**.

FIGURE 8-6. *CLOUD Colors Dialog*



- For **Depth** and **Intensity**, click the corresponding icon and define the desired for the depth or intensity range found in your data set.
- **Color by File**: Each data file that you have loaded in CLOUD will be listed under 'Color by File'. You can assign or modify the color for each file by clicking on its color square and selecting a new color from the dialog that appears.

3. **Choose the value displayed** by clicking the corresponding 'Color By' icon in the tool bar.

FIGURE 8-7. *Color By Depth (left), Color By File (center), Color By Intensity (right)*

Keyboard and Mouse Commands:

Tasks	Keyboard	Mouse	Control Panel
Window Manipulation			
• Zoom in/Zoom Out	+/-	Wheel Up/Down	
• Center display on screen, all rotation values set to zero, Z Axis Ratio set to 1.	Home		

Tasks		Keyboard	Mouse	Control Panel
• Center display on screen, maintain rotations			Click 'Center' Icon then on the point to center	
• Shift the display		Shift + Arrows	Right-click and Drag	
Model Manipulation				
• Increase pixel size		<		Pixel Size
• Decrease pixel size		>		Pixel Size
X Axis	Rotate 1 degree	Up/Down Arrows	• Shift + Wheel Up/ Down • Click and Drag up/down	X Axis Rotation Value
Y Axis	Rotate 1 degree			Y Axis Rotation Value
Z Axis	Rotate 1 degree	Left/Right Arrows	• Shift + Wheel Up/ Down • Click and Drag left/right	Z Axis Rotation Value
	Increase/ Decrease Scale	Page Up/Down		Z Axis Ratio
	Invert Z Axis		Click the 'Depth/ Elevation' icon.	

More Information

- "Sounding Color Settings in HYPACK®" on page 1-34

MEASURING RELATIVE DISTANCE AND BEARING IN CLOUD

You can use the cursor in CLOUD to measure the distance and bearing between two points in the model.

1. **Hold the Shift key down and select the first point**. It will turn red and its coordinates appear in the status bar.
2. **Hold the Shift key down and select the second point**. It will turn red and its coordinates will appear as X2 and Y2 in the status bar. The previous point turns blue, its coordinates remain as X1 and Y1 and the distance and angle of inclination[1] between the two points are calculated and displayed.

If you continue to hold Shift and select points, the status bar display will update to display the last two points selected and the new distance and angle of inclination measurements.

EDITING YOUR DATA IN CLOUD

CLOUD includes unique tools with which you can edit the actual soundings in your data.

There are two editing methods:

- Select and remove soundings
- Remove soundings above or below a user-defined line.

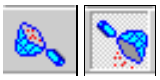
To reverse one or more editing operations, in the reverse order in which you performed them, click the 'Undo' icon.

More Information

- "Deleting CLOUD Data Using the Select and Remove Method" on page 8-222
- "Deleting CLOUD Data Above or Below A User-defined Line" on page 8-223

DELETING CLOUD DATA USING THE SELECT AND REMOVE METHOD

Selecting the soundings you want to remove from your dataset may actually be a combination of selecting and deselecting one or more soundings to mark the data you will remove.

1. **Choose select or deselect mode.** One icon on the toolbar toggles between the two mode. The graphic and tool tip indicate the current modes. If you need to change modes, click the icon. 
2. **Mark the soundings to be removed.**
   - **To select individual soundings:** In Select Mode, click the Select Point icon then on each sounding you want to include in your selection.

     NOTE: This operation is much easier if you use a larger pixel size than the default 1 pixel setting. Click the Setup icon and set your pixel size in the dialog.

1. **Angle of Inclination:** Angle between a line extended horizontally from the first point and a line drawn from the first to the second point.

- **To select blocks of soundings:** In Select Mode, click the Select Block icon then drag your cursor to define the block you wish to select.

NOTE: You can only draw blocks whose sides are parallel to the edges of the window.

TIP: If you need to select a block of points at a different angle in your model, rotate the model then select the block.

- **To deselect individual soundings:**In Deselect Mode, click the Select Point icon then click each sounding you want to remove from in your selection.

- **To deselect blocks of soundings:** In Deselect Mode, click the Select Block icon then drag your cursor to define the block you wish to deselect.

- **To deselect all selected soundings,** click the Clear Selection Icon.

3. **Remove the selected points** from your data set by clicking the erase icon.

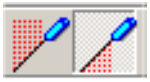
4. **Save the results.** Regardless of the number and type of files you load to CLOUD, you can save the data back to the original format or to XYZ format as follows:
   - **To overwrite the files originally loaded**, click the Save Icon.

   - **To save the data back to the original number and format** of the files originally loaded, but with new names, click the Save As icon and enter a name for each file.

     If you have loaded multiple files, a File Save dialog will open for each file originally loaded. With this method, you can edit multiple files at the same time and in the context of all of the datasets, but save them individually rather than to one file.
   - **To save all of your data to one XYZ file**, click the Save As XYZ icon and name your output file.

DELETING CLOUD DATA ABOVE OR BELOW A USER-DEFINED LINE

The Delete Above Line and Delete Below Line tools enable you to draw a line across your CLOUD display and remove all soundings that fall either above or below the line, according to the selected tool.



NOTE: *This may not be above or below a certain sounding depth.* It removes the data above or below the line in the current display.

FIGURE 8-8. *Deleting Above the Line*

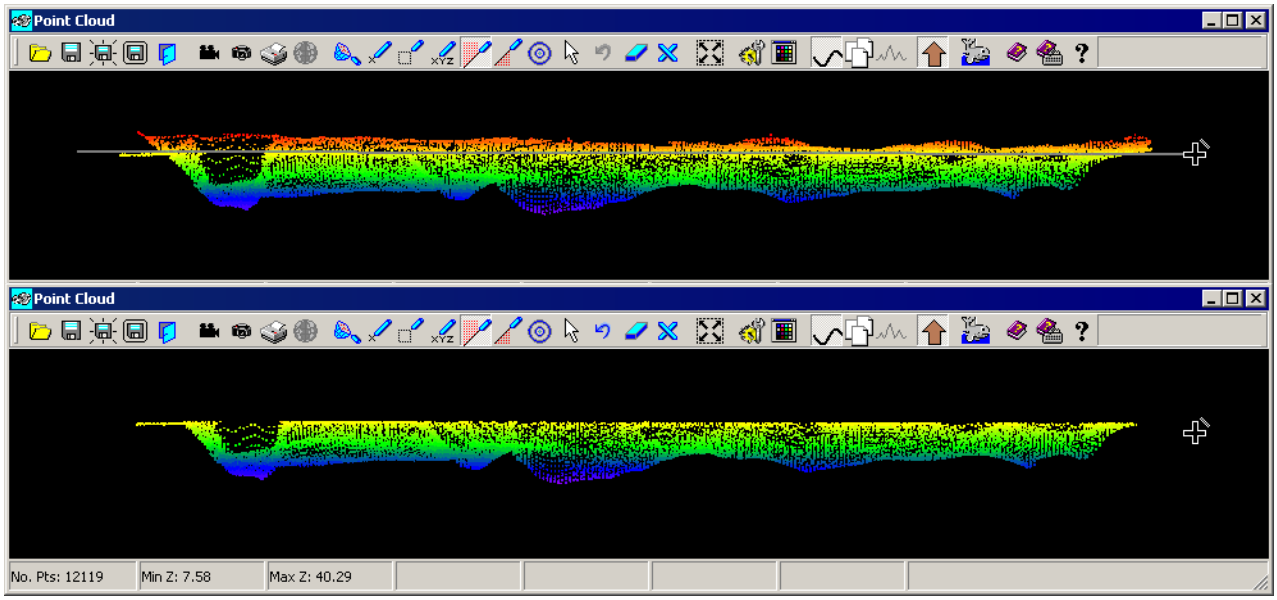
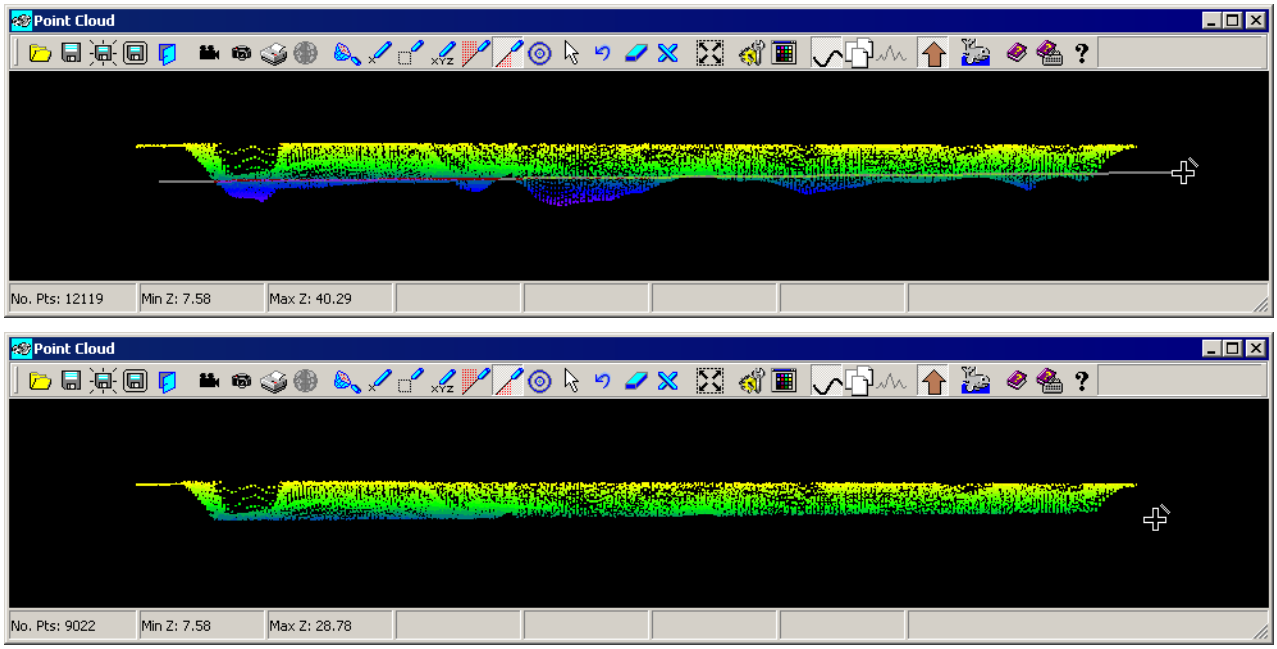


FIGURE 8-9. *Deleting Below the Line--Before (top) and After (bottom)*



EXPORTING GRAPHICS FROM CLOUD

The tool bar includes icons that enable you to export your model in a graphics file format. You can export:

- **A Geo-referenced *.TIF file** which can then be used as a background file in HYPACK®, SURVEY, DREDGEPACK® or HYPLOT.

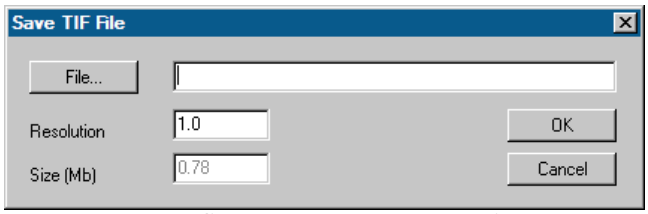
- **Screen captures** in BMP format.
- **Printed screen captures**

EXPORTING GEO-REFERENCED TIF FILES FROM CLOUD

To create a geo-referenced TIF all rotation angles must be set to zero. If the model is rotated in any direction, the icon will be disabled. You must go to the Setup dialog and reset them to zero before you can export a geo-referenced TIF.

1. **Click the Geo-TIF Icon on the tool bar**. The Geo-TIF Settings dialog will appear

FIGURE 8-10. *Geo-TIF Settings Dialog*



2. **Name your file and set your resolution.**
   - **[File…]** presents a File Save dialog for you to name your file (including the path where it will be stored). The default path will be to your project folder
   - **Resolution** adjusts the level of detail in the resulting file. A smaller resolution creates a larger, more detailed file. Your task is to choose a resolution low enough to provide the detail you require without creating an overly large file. The **size** of the resulting TIF will automatically update according to the given resolution.
3. **Click [OK]**. CLOUD will create a geo-referenced TIF file from the contents of the CLOUD viewing screen. You can then load it to HYPACK® as a background file.

EXPORTING YOUR CLOUD MODEL AS A BMP IMAGE

To save a screen capture of a model, regardless of its rotation, to a BMP file, click the Snap Shot icon in the tool bar. A dialog will appear for you to name your image. These are for visual reference only. *They can not be used as background files in HYPACK®.*

PRINTING A SCREEN CAPTURE OF YOUR CLOUD MODEL

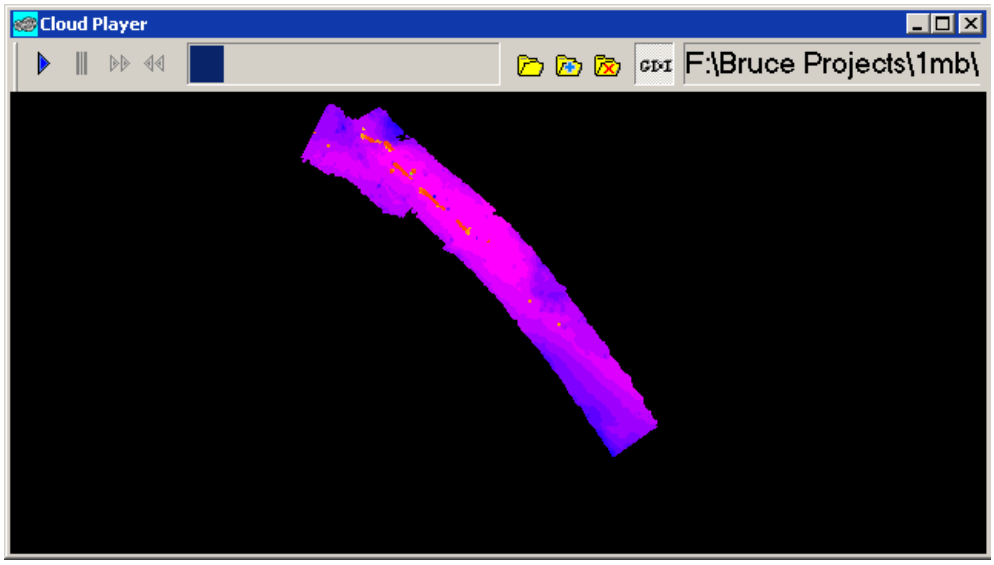
To print a screen capture, just click the Print Screen Icon. A screen capture is sent directly to your default printer.

CLOUD PLAYBACK

The playback feature draws the data, one swath at a time, to the screen to simulate the map display during survey.

1. **Launch the playback window** by clicking the Playback icon.

FIGURE 8-11. *CLOUD Playback*



2. **Load the data files you want to replay.** The program supports HS2, XYZ, matrix and LOG files of either HS2 or All format.
   - **Load the first file** using the Clear and Load icon.
   - **Load any additional files** using the Append icon
   - **Unload all files** using the Remove All icon.

FIGURE 8-12. *File Loading Controls --(From left to right) Clear and Load, Append, Remove All*

3. **Select the drawing mode.**
   - **OpenGL**: Supported by most newer computers. Try this option first.
   - **GDI**: Older digital drawing method. Use this method if the OpenGL method doesn't draw smoothly.
4. **Play the data.** Use the play controls to start and stop, speed up and slow down.

FIGURE 8-13. *Playback Controls--(From left to right) Play, Pause,Speed Up, Slow Down*

NOTE: Playback supports all CLOUD keyboard controls that shift and rotate the display.

CHAPTER 9

DREDGEPACK®

DREDGEPACK® enables you to monitor and track digging operations for all dredge types. DREDGEPACK® monitors the position and depth of the cutting tool in real time and re-maps the bottom based on the depth and location of the digging tool. The color-coded depth information is displayed in plan and profile views to show the "As Surveyed" and the "As Dredged" depths for millions of cells. This enables you to maximize digging efficiency and provide a record of digging operations.

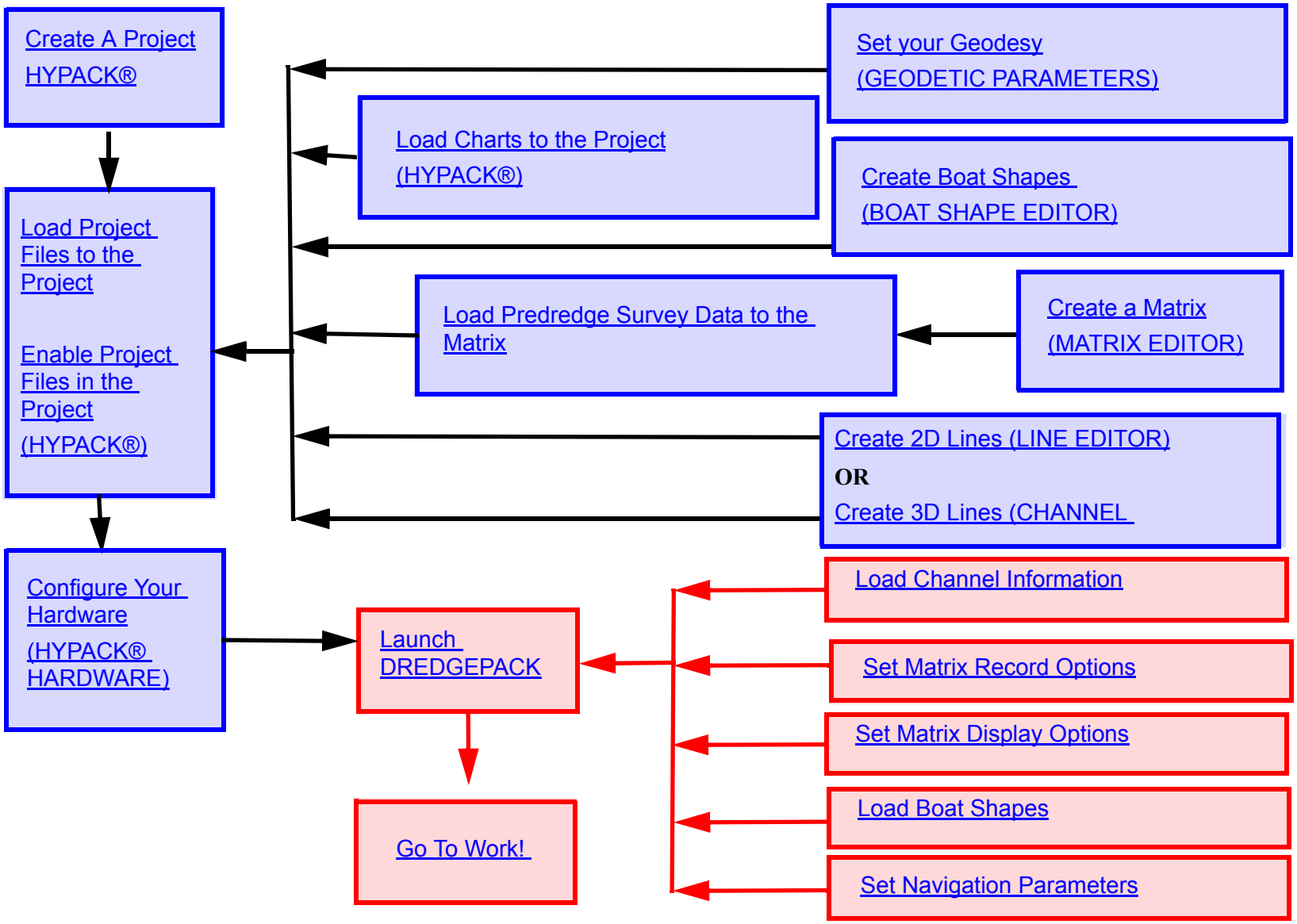
If you are using a bucket dredge, you can use a bucket pattern display instead of, or together with, the matrix display to track the dredge depths. In capping operations, the bucket pattern display can be used to track how many buckets of soil have been placed in each location.

The DREDGEPACK® module is only enabled if you have a DREDGEPACK® license. In addition to running DREDGEPACK®, your dongle will also enable you to operate several HYPACK® functions that are needed to support the program.

Once you have setup your project, you are ready to set up your SURVEY options. The consider the following tasks before you begin to collect data:

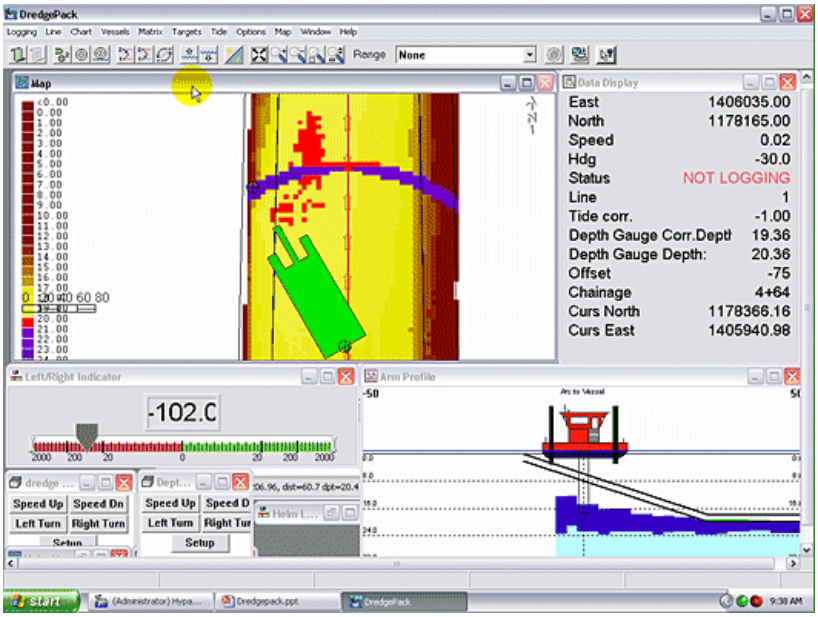
- **Set the correct geodesy settings.**
- **Test and calibrate your hardware.** Do this *before* you are far from shore with pressing deadlines.
- **Configure the size, position and features of the display windows**.
- **Load and configure planned survey lines.** (Optional. Recommended for survey projects.)
- **Set the Navigation Parameters**.
- **Input the Project Information**.
- **Configure your Boat Features**.
- **Load and configure any Target Files** (Optional.)
- **Load and configure any Matrix Files** (Optional. Recommended in dredging projects.)
- **Preset your Tide Corrections information** (Optional.)
- **Automate your Draft/Squat** (Optional.)

FIGURE 9-1. *Dredgepack Flowchart*



DREDGEPACK® INTERFACE

FIGURE 9-2. *DREDGEPACK® Interface*

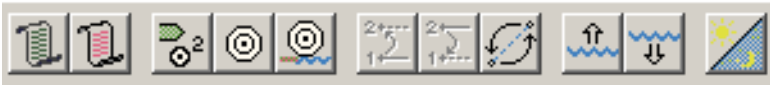


To launch SURVEY, click the SURVEY icon (the whale) or select SURVEY-SURVEY.

The SURVEY program loads the information from the current project. It gets geodetic information and hardware information by reading the project's initialization files. It will load the most recently used planned survey line file (*.LNW) from the current project, as well as any background files and matrix files that are currently 'Enabled'.

SURVEY functions can be executed through the menus in the shell, the (optional) tool bar, or through keyboard shortcuts.

FIGURE 9-3. *SURVEY Tool Bar*



The tool bar is a row of icons that duplicate the function of several of the menu selections. To determine each icon's function, hold the cursor over the icon and a tool tip will appear.

Though color schemes are defined in the SCHEME BUILDER program, you can choose an alternate color scheme to use while you are in SURVEY from the OPTIONS-COLOR SCHEME menu item and SURVEY will immediately assume the new color scheme. This is handy if the environmental lighting changes while you are working as it allows you to change to a more suitable scheme without suspending your survey.

RUNNING DREDGEPACK®

The following outlines a typical DREDGEPACK® task sequence.

1. **Create a new project** in the HYPACK® shell.
2. **Conduct a pre-dredge survey** of your project area.
3. **Create a matrix file of your project area and fill it with your pre-dredge survey data.** If your pre-dredge survey is done with a multibeam system, you can also save your edited data to a matrix in the HYSWEEP® EDITOR.
4. **Enable your matrix in the project.** When you launch DREDGEPACK®, it will automatically load enabled matrices.
5. **Configure your hardware**. Your GPS and dredging equipment are entered in the HYPACK® HARDWARE program.
6. **Create a file to describe your channel design (optional).** This provides template information which can be displayed in the Profile window to guide your work. For this purpose, DREDGEPACK® can read:
   - **A Channel Plan file (*.PLN)** created in the CHANNEL DESIGN program.
   - **A Channel file (*.CHN)** created in ADVANCED CHANNEL DESIGN.
   - **A Planned Line file (*.LNW)** combined with a channel **Template file (*.TPL).** The line file, created in the LINE EDITOR, represents only the center line of your channel. The template file, created in the template editor of either CROSS SECTIONS AND VOLUMES or the LINE EDITOR, is aligned with the center line and provides the channel geometry.
7. **Generate a planned line file. (optional)** This can be displayed in DREDGEPACK® to guide your dredge operator.
8. **Launch DREDGEPACK®** by clicking the DREDGEPACK® icon or selecting SURVEY-DREDGEPACK®.
9. **Set the matrix file options**.
10. **Use your Matrix and the Profile window to guide you as you dredge**.
    - The **sounding data** in the Matrix will be repainted, in real time according to the Matrix Options settings. You can paint new data as you dredge and compare it to the pre-dredge depths.
    - If you have loaded **channel design** information, it will be drawn in the Profile window where you can see it and its position relative to your cutter head.
11. **Save your data.** You can save the filled matrix (FILE-SAVE MTX) or only the sounding data in XYZ format (FILE-SAVE AS XYZ).

DREDGEPACK® should automatically save the matrix when you exit the program, but just to be sure, it's a good idea to save your data manually at the end of each day.

More Information

- "Dredge Configurations" on page 2-241
- "Boat Features in DREDGEPACK®" on page 9-14
- "Charts in DREDGEPACK®" on page 9-16
- "Tide Corrections in DREDGEPACK®" on page 9-17
- "Draft Corrections in DREDGEPACK®" on page 9-18
- " Logging Data in DREDGEPACK®" on page 9-20
- "Dredge Volume Estimates" on page 9-33

WINDOWS IN DREDGEPACK®

- **Profile:** Displays the cross section display through the cutting tool, based on the current orientation of the vessel. It shows the 'As Surveyed' and 'As Dredged' profiles for a section through the cutting tool.

  The water level changes based on tide input. A model dredge rises and falls based on tide and draft input.
- **Device Windows:** Each device (GPS, echosounder, etc.) has an independent window that displays information relative to that device.
- **GPS Graphs**: Graphical displays of various GPS-related data.
- **Alarms**: Alarms are displayed along the bottom of the SURVEY shell. These are used to denote error conditions to the operator.

To generate additional window displays, select WINDOW-NEW and select the type of window you want.

SURVEY can display multiple windows of each type, each independently configurable through its menus. Multiple windows of the same type are distinguished by numbers, both on their title bars and in the Window Manager.

You may reposition and size all windows using the Window Manager or by using the cursor to drag the title bars and window edges. Arrange the windows in one or more monitors.

Once you have sized and placed the windows on the screen, the SURVEY program will remember and restore them to the same status and location each time you start the SURVEY program.

Most windows in DREDGEPACK® are the same as those that appear in SURVEY.

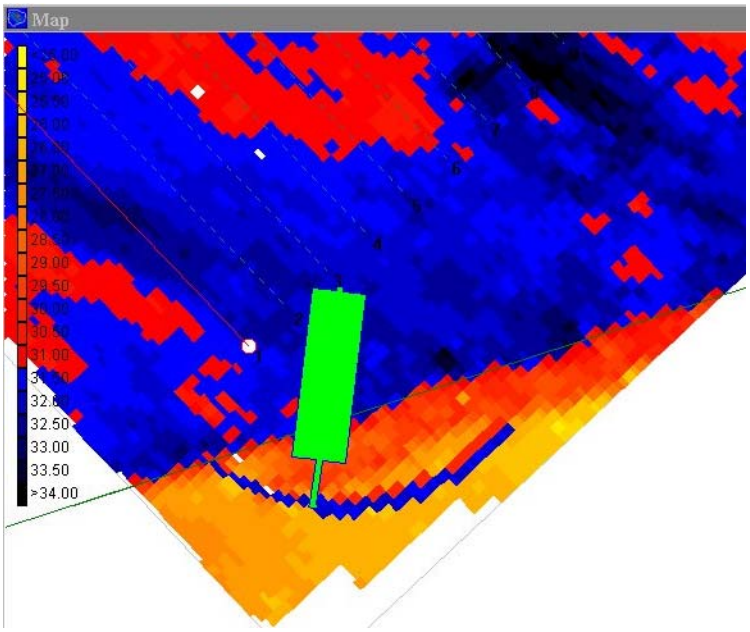
See Also

- "Device Windows" on page 3-12
- "GPS Graphs" on page 3-14
- "Alarms in SURVEY" on page 3-16
- "Configuring your Window Display with the Window Manager" on page 3-17
- "Broadcasting Survey Windows over the Network to the Survey Viewer" on page 3-18

AREA MAP WINDOW IN DREDGEPACK®

The Area Map window contains a plan view of your survey area that includes all files active in HYPACK® when you start DREDGEPACK® and a symbol representing each mobile in your hardware configuration.

FIGURE 9-4. *Sample Area Map*



We suggest that you configure your display as follows:

- **Matrix Options:** In the shell menu, select MATRIX- OPTIONS and set **Record Depth** to Maximum values when you are working in Depth Mode, (Minimum when you are in Elevation Mode)
- **In the Area Map window**, select MATRIX-DISPLAY OPTIONS and opt to show dredge data.

With these settings, as the cutting tool passes over each cell, it determines the cell over which the cutting tool is positioned. If the depth of the cutting tool is deeper than the previous 'As Dredged' depth or the 'As Surveyed' depth for the cell, it saves the depth of the cutting tool to the 'As Dredged' data set. The screen displays either the 'As Surveyed' depth (if it is greater than the 'As Dredged' depth) or the 'As Dredged' depth (if it is greater than the 'As Surveyed' depth. This provides the operator with a useful graphic to determine areas that remain to be dredged to achieve the project depth.

Alternatively, in the display options, you may choose to view the difference between the "As Surveyed" depths and the "As Dredged" depths. This shows how much material has been added or removed during dredging.

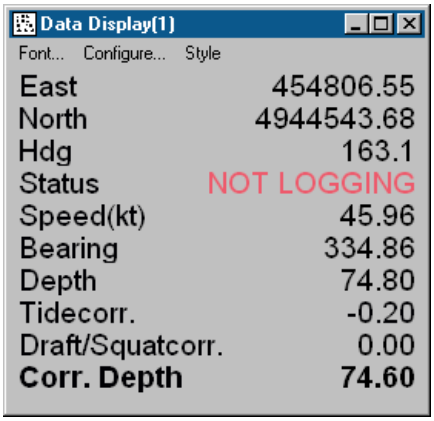
More Information

- "Loading Files to your Area Map Display" on page 3-29
- " Area Map Display Controls" on page 3-30

DATA DISPLAY WINDOW IN DREDGEPACK®

The Data Display window is identical to the one described in the SURVEY program.

FIGURE 9-5. *Sample Data Display*



See Also

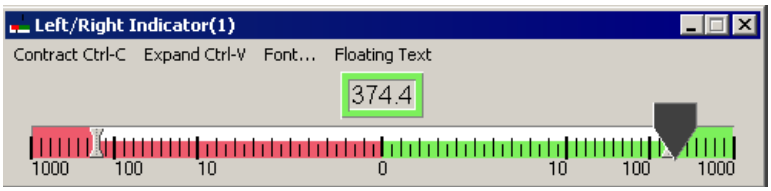
- " Data Display Window in SURVEY" on page 3-6

LEFT-RIGHT INDICATOR IN DREDGEPACK®

The Left-Right Indicator window only appears when you have planned lines loaded into the SURVEY program. It shows the position of the survey boat relative to the planned survey line.

Additional, displays can be loaded by selecting WINDOW-NEW- LR INDICATOR.

FIGURE 9-6. *The Left-Right Indicator*



More Information

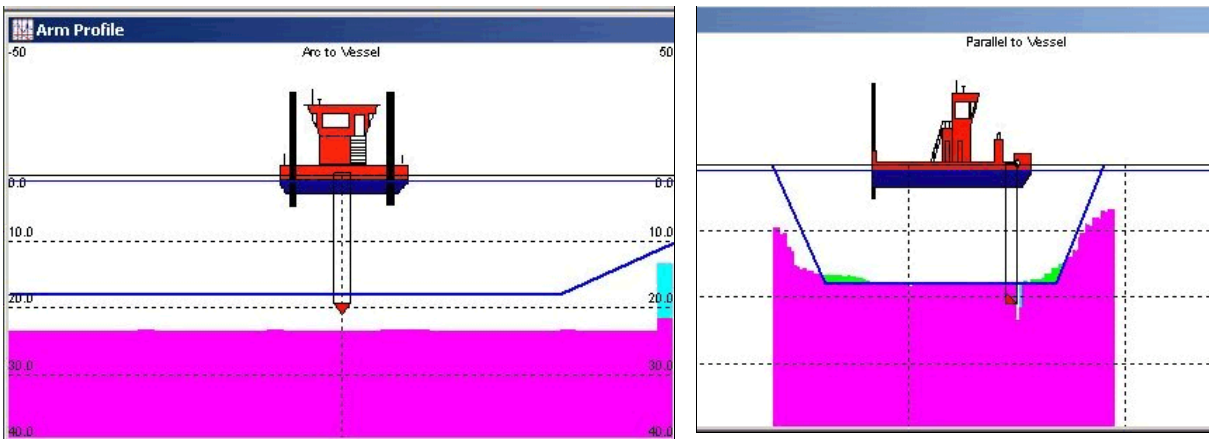
- "Left-Right Indicator in SURVEY" on page 3-5

BOAT PROFILE WINDOW IN DREDGEPACK®

The Boat Profile window provides a cross section display through the cutting tool, based on the current orientation of the vessel. It shows the 'As Surveyed' and 'As Dredged' profiles for a section through the cutting tool.

The water level changes based on tide input. A model dredge rises and falls based on tide and draft input.

FIGURE 9-7. *Sample Boat Profile Windows in DREDGEPACK®*



LOADING CHANNEL PROFILE INFORMATION

If your planned line file does not include channel template information, you can load any of the following files in SURVEY to provide that information.

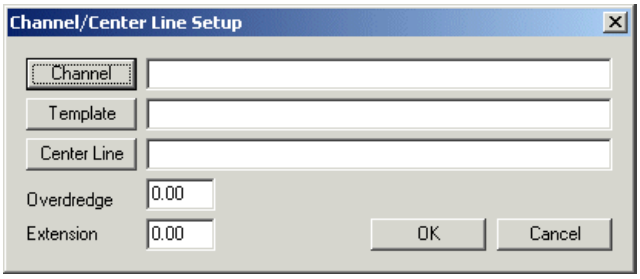
The cross section profile in the Profile window can be drawn from:

- **A Channel Plan file** (*.PLN) created in CHANNEL DESIGN.
- **A 3-dimensional Line file** (*.LNW) created in CHANNEL DESIGN or in the LINE EDITOR.
- **An Advanced Channel file** (*.CHN) from ADVANCED CHANNEL DESIGN or TIN MODEL.
- **A combination of a 2-dimensional center line created in the LINE EDITOR and a template (*.TPL) created in CROSS SECTIONS AND VOLUMES or LINE EDITOR.** In this case, the line file should have only one line representing the center line of the channel. It can be a multi-segmented line. Create the template file referencing the distances to the center line; negative values are left of the center line and positive values are right. Negative depths will be recognized as points above chart datum. The program will automatically enter the correct depths and widths according to the template information. The resulting channel will also be displayed in the Map Window.

Loading Channel Features:

1. **Select CHART-CHANNEL** and the Channel/Center Line Setup dialog will appear.

FIGURE 9-8. *The Channel/Center Line Dialog*



2. **Click the button that corresponds to the information type** you want to add and choose the file through the File Select dialog. [Channel] accepts PLN, CHN or LNW files.
3. **Add any Overdredge or Extensions**.
   - **Overdredge** draws a line a user-defined distance outside of the template, parallel to the side slopes and bottom.
   - **Extensions** lengthen the features outward from the top of the bank by this amount.
4. **Click [OK]**.

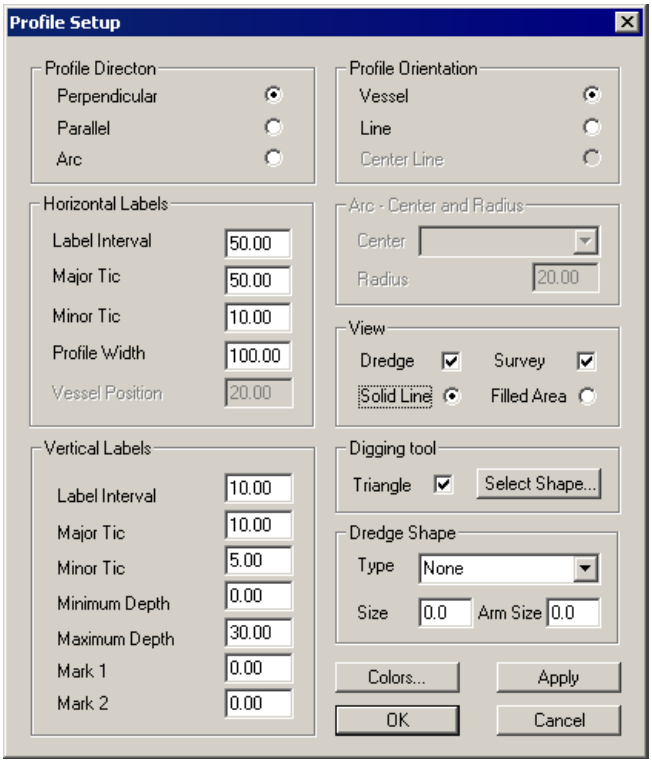
CHANNEL PROFILE DISPLAY OPTIONS IN DREDGEPACK®

DREDGEPACK® displays a profile window for each mobile. Each window is independently configured.

To configure the Profile Window:

1. **Click SETUP in the profile window**. The Profile Setup Window will appear.

FIGURE 9-9. *Boat Profile Setup Dialog*



To define the contents of the Boat Profile window:

1. **Choose the profile direction and orientation**.

   The **Perpendicular Profile Direction** displays a profile at the cutter head, and of user-defined length.

   - A straight line cut perpendicular to the **vessel**.
   - A straight line cut perpendicular to the survey **line**.
   - **Profile Width** sets the length of the profile graph in survey units. The tracking point of the vessel will be centered in the profile.

   Parallel Profile Direction displays a profile parallel to either the **vessel** or the survey **line**, and of a user-defined length.

   - **Vessel Position:** If you choose a profile parallel to the vessel, a portion of the length is drawn 'in front' of the vessel and the remaining length is drawn behind the vessel. The vessel position relative to the profile is adjusted using the Vessel Position setting. It is the position of the digging tool within the profile length. For

example: If the Length is set to 500, a Vessel Position of 250 will position the digging tool in the center.

- **Profile Width** determines the length of the profile in survey units.
- **Arc** shows a curved profile of user-defined length and Arc Radius centered on the cutter head tracking point.
- **Arc** shows a curved profile centered on the cutter head tracking point.
  - **Center:** Select the tracking point appropriate to the profile window that you are configuring. **Automatic** computes Arc Radius from digital feed.
  - **Radius:** The should be the distance from the spud to the cutter head.
- **Profile Width** sets the length of the Arc in survey units.

2. **Set channel and depth view options** affect the display of channel and depth information.

   Solid Line and **Filled Area** determine how the bottom profile is displayed.

   Dredge and **Survey** display dredging and pre-dredge depths respectively.

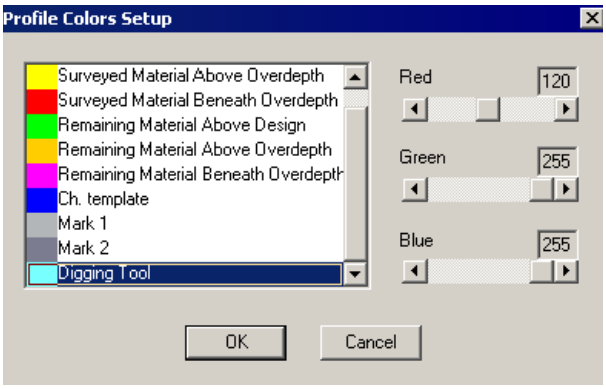
3. **Dredge Shape:** DREDGEPACK® includes profile and center views of a 'generic' dredge you may display in the Profile window. The options allow you to configure the display to match the type of cutter suction or hopper dredge you have.
   - **Type:** Multiple Hopper Type options enable you to configure profile windows with one or more hopper arms located either on the side or in the center. To display only the cutter head location, select 'None'.
   - **Size:** The length or width of your dredge (in survey units).
   - **Arm Size:** The length of the arm (in survey units).

   The **Digging Tool** option is in development to draw a boat shape file in place of a generic triangle. As of the 2010 release, it can only display the triangle at the cutter head location.

4. **Label Options:**
   - **Tics** and **Label Interval**: The horizontal and vertical axes of the profile window are configured with labels and two sizes of tics at user-defined intervals (survey units) to provide scale to the display.
   - **Min Depth** and **Max Depth** set the vertical range of the graph display. In depth mode, the minimum depth should be 0. In elevation mode, the minimum depth is the chart datum level.
   - **Mark 1** and **Mark 2** draw horizontal lines across the graph display at the specified depths.

5. **[Colors]** enables you to set unique colors for . Select a feature on the left then use the color controls to adjust the color. Click [OK] to return to the Boat Profile Setup dialog.

FIGURE 9-10. *Setting the Profile Colors in Dredgepack*



DISPLAYING THE VESSEL IN THE PROFILE WINDOW OF DREDGEPACK®

In the Profile Setup dialog, the **Dredge Shape** settings enable you to include an approximate representation of your dredge in your Profile Window. You can use the dredge shapes created by HYPACK, Inc. or create new ones that look a little more like your dredge.

In either case, enter the dimensions of the dredge and the length of the arm (measured in survey units) then select the type of dredge that you are using. (A setting of '**None**' displays only the cutter head location.)

The Profile Window will display a figure approximating your dredge according to these settings.

NOTE If the scale or the arm angle (or both) looks a little peculiar, check the scaling of the Profile Window. The horizontal and vertical scales are independent of each other and can skew the display of the vessel.

When a Dredge Shape is loaded, DREDGEPACK® will also display a blue waterline which will be positioned in your window according to the current tide correction values. As the tide rises and falls, your vessel is positioned accordingly.

The vertical position of the boat is also affected by its draft. The "Level" measurement must be corrected in the initialization file to more accurately display your dredge relative to the waterline. The vertical position of the Dredge Shape will change relative to the waterline as the draft changes.

FIGURE 9-11. *Boat Profile – Perpendicular View*

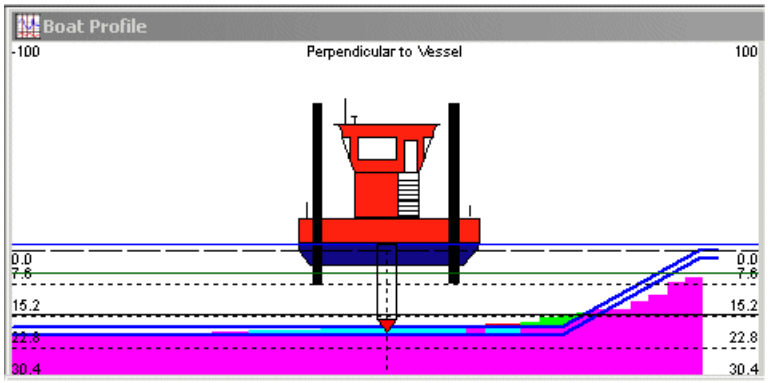
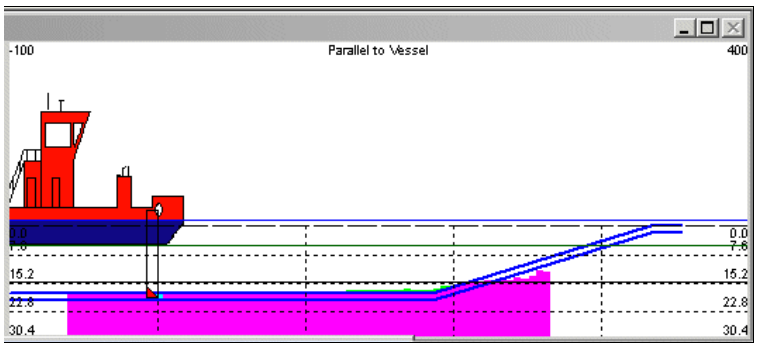


FIGURE 9-12. *Boat Profile – Parallel View*



CUSTOMIZING YOUR DREDGE DISPLAY

You can customize your dredge display for your dredge by:

- Creating your own dredge shapes that look more like your vessel side and end views.
- Editing the *.ini files for your Dredge Shape type.

The Custom Dredge Shape:

DREDGEPACK® requires bitmaps of the starboard and end view of your vessel. You can:

- **Import photos**, saved in BMP format. In this case, we suggest that you replace the background with white space.
- **Use a graphics program to create a scale drawing** of your dredge's starboard side view and rear view and save them as *.BMP files.

The Dredge Type Initialization File:

Each Dredge Shape type has two *.INI files, one for the parallel to vessel view and one for the perpendicular to vessel view. They tell

DREDGEPACK® about the *.BMP file and how to position it in your Profile Window and are stored in the \Hypack\Shapes directory.

Dredge Shape Type	Profile View	INI File
Cutter Suction	Perpendicular to Vessel	Cuttercross.ini
Cutter Suction	Parallel to Vessel	Cutterprof.ini
Hopper (Center)	Perpendicular to Vessel	HopperCrossC.ini
Hopper (Center)	Parallel to Vessel	HopperProfC.ini
Hopper (Right)	Perpendicular to Vessel	HopperCrossR.ini
Hopper (Right)	Parallel to Vessel	HopperProfR.ini
Hopper (Left)	Perpendicular to Vessel	HopperCrossL.ini
Hopper (Left)	Parallel to Vessel	HopperProfL.ini

Use a word processing program to edit the initialization files that correspond to your Dredge Shape Type. The following is a sample file.

```
[General]
Level=85
ArmX=336
ArmY=78
BMPFILE=c:\hypack\shapes\cutterprof.bmp
```

Each graphic is measured in pixels using an X,Y coordinate system where 0,0 is the upper left corner. Level, ArmX and ArmY are all based on this system. It is not the same as your hardware offset measurements.

Level is the BMP Y coordinate corresponding to the water level when the draft is 0.

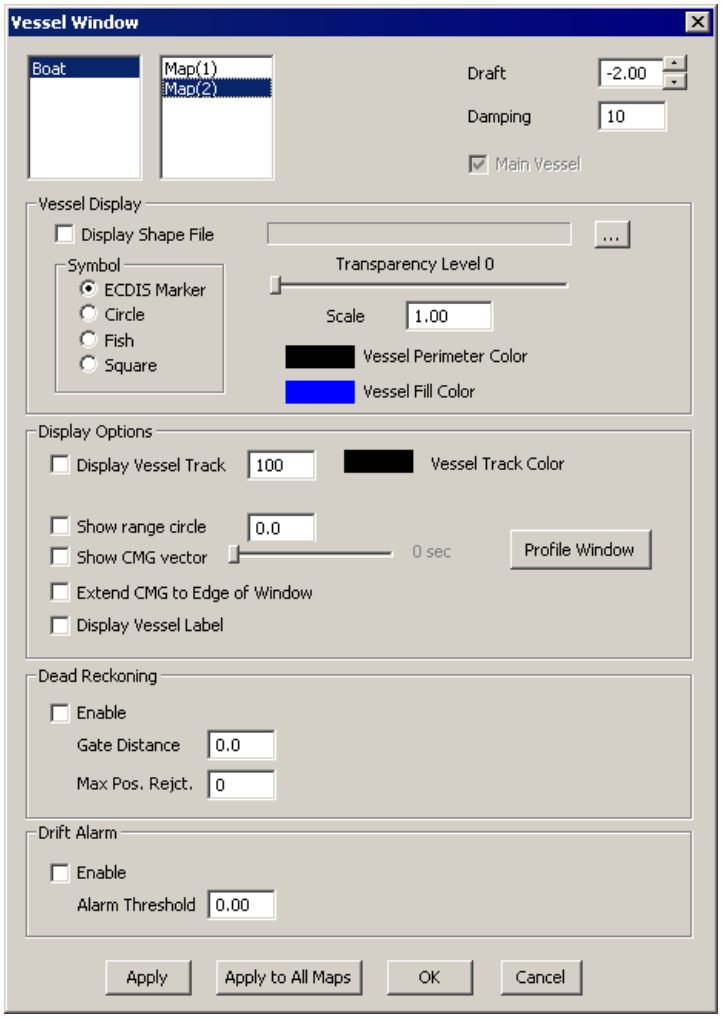
ArmX and **ArmY** describe where the drag arm is attached to the vessel.

BMP File names the file, including the path, of the graphic file. You would use the side view graphic for Profile Views that are parallel to your vessel and the end view graphic for the perpendicular to vessel Profile View.

BOAT FEATURES IN DREDGEPACK®

You can configure the display options and draft correction for each vessel through a Vessel Setup dialog. In addition, each Map window can display the same vessels identically or differently, each according to its own vessel setup.

FIGURE 9-13. *Vessel Setup Dialog*



1. **Open the Vessels Setup dialog** by clicking VESSELS on the menu bar.
2. **Select the vessel whose features you want to modify and the Map window for which these settings apply** at the upper left.
3. **Choose your vessel settings and click [Apply].** The Apply button allows you to preview your display before exiting the dialog. If it doesn't suit you, make some adjustments and apply again.
4. When you are satisfied, **click [OK].**

The configuration for each vessel is saved when you exit the SURVEY program and are restored when you re-start the program.

Vessel configuration options are the same as those found in SURVEY.

More Information

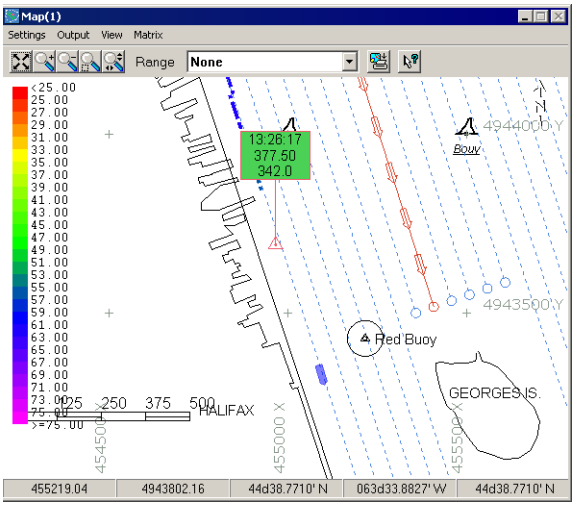
- “Boat Track Parameters” on page 3-38
- “Boat Shapes and Symbols in SURVEY” on page 3-35
- “Specifying the Main Vessel in Survey” on page 3-34
- “Anchors in Survey” on page 3-40

CHARTS IN DREDGEPACK®

The SURVEY program loads the information from the current project. It gets geodetic information and hardware information by reading the project’s initialization files. It will load the most recently used planned survey line file (*.LNW) from the current project, as well as any background files and matrix files that are currently “Enabled”.

In addition to background chart files, you can also load several other HYPACK® file types in SURVEY (eg. BRD, CHN, MTX, LNW, PLN, TGT...) *for display purposes only.*

FIGURE 9-14. *SURVEY with a Target File as Background File (Red Buoy) and an Active Target File (13:26:17).*



More Information

- “Loading Charts during SURVEY” on page 3-42
- “Unloading Charts during SURVEY” on page 3-43

CORRECTIONS IN DREDGEPACK®

TIDE CORRECTIONS IN DREDGEPACK®

In HYPACK®:

Final Depth	=	Measured Depth	+	Tide Correction	+	Draft Correction	+	Sound Velocity Correction

Since the tide correction is normally added to the measured depth, it will normally be a negative value in HYPACK® (unless the tide drops below the chart datum).

For example, if the water level is 1.3m above the chart datum, the tide correction in HYPACK® would be "-1.3".

To assign tide corrections to your sounding data:

- Use a telemetry tide system
- Manually enter tide corrections in the SURVEY program
- Use the Real Time Kinematic (RTK) Tide options in the GPS device driver.
- Read predicted tides into SURVEY using the Tidefile driver.
- Enter the tide correction values in post-processing

Configure you Data Display window to show tide data:

You can display one or more of the following tide data in the Data Display:

- Current tide correction
- Measured depth from the echosounder
- "Corrected" depth

Since the tide correction is applied to all vessels, it is displayed in Black in the Data Display window.

More Information

- "Tide (Water Level) Corrections" on page 8-1
- " Data Display Window in SURVEY" on page 3-6

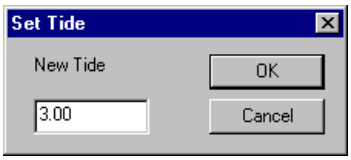
TELEMETRY TIDE GAUGES

The SURVEY program treats telemetry tide gauges like another piece of survey equipment. A device driver in the hardware configuration receives data from the device. Every time it receives an update from the telemetry tide gauge, it sets the tide correction to the appropriate value.

MANUAL ENTRY OF TIDE CORRECTIONS IN DREDGEPACK®

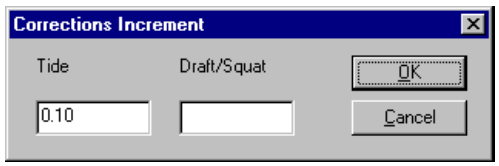
You can set the initial value of the tide correction by clicking the TIDE–SET menu item. This value will be assigned to all soundings logged until you set a new value. Update this value often, especially if the tide level is changing quickly.

FIGURE 9-15. *Setting the Tide Value*



The Tide Increase (Alt-Y) and Tide Decrease (Alt-Z) can be used to increase or decrease the current tide value by the current increment. The increment is set from the OPTIONS–CORRECTIONS INCREMENT menu item.

FIGURE 9-16. *Setting the Corrections Increments*



NOTE: If you use the same time and tide correction information to create a tide correction file, then use it to apply your corrections during post-processing, your results will be more realistic. The editor will interpolate the tide correction values over time, thus avoiding the sudden changes in tide correction values.

The tide correction value at the time each raw file is opened will be recorded in the header of the file. Each time you modify the correction value, it will be recorded as a TID record and used to correct soundings taken after that time.

DRAFT CORRECTIONS IN DREDGEPACK®

In HYPACK®, Final Depth = Raw Depth + Static Draft + Dynamic Draft (+ Tide, SV and Heave corrections)

To log accurate depths, you must correct for both static and dynamic draft.

Static draft is typically incorporated into the echosounder during calibration so the sounder outputs depths corrected for static draft.

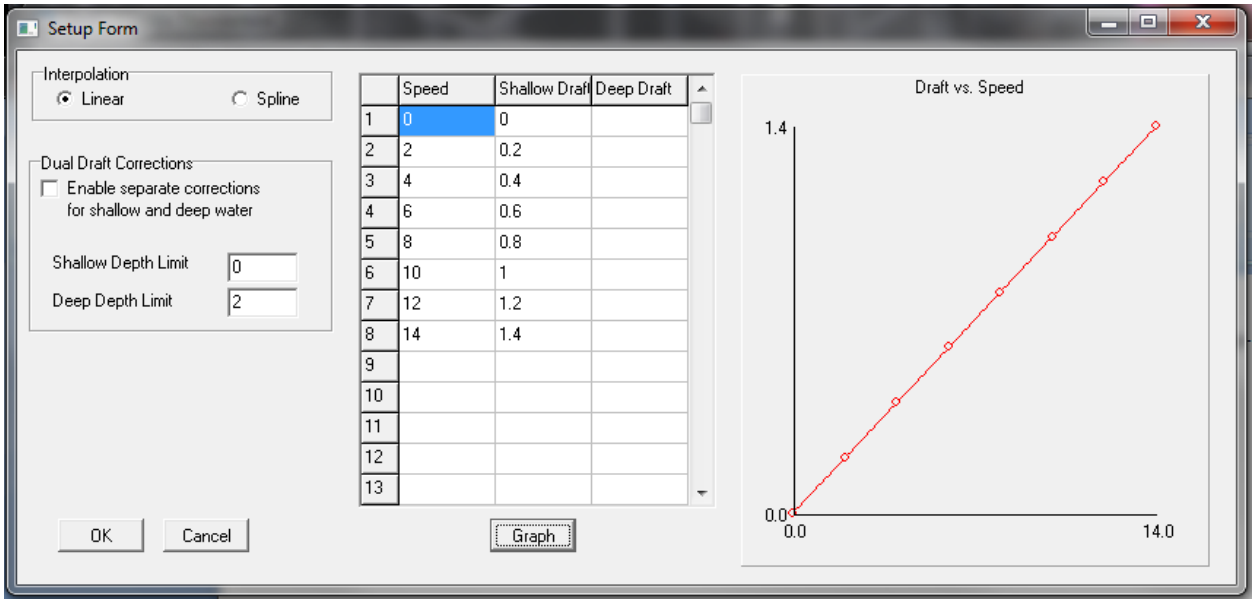
Alternatively, you can enter the static draft as a vertical offset in your hardware configuration.

Dynamic draft corrections are logged with the rest of your data using your choice of the following options:

- **Manual Corrections:** Use the Draft option in the Vessel Setup dialog to adjust the correction currently logged in the data file. This value is logged in the header of each data file and to a DFT record each time it is changed.
- **Use the DraftTable Driver:** The DRAFTTABLE.DLL allows you to construct a table of Dynamic Draft Correction versus Speed. The driver then uses the Speed Over Ground from the GPS (or the internal speed computed by SURVEY) and interpolates a draft correction based on the Speed Over Ground.

NOTE On a river, your speed through the water column may not equal your speed over ground. This could cause some significant errors in the Dynamic Draft correction being assigned by the driver.

FIGURE 9-17. *Configuring the DraftTable Driverr*



In dredge configurations, the need for draft varies depending on the type of dredge.

- On **excavators and bucket dredges,** the draft is taken into account during the calibration process.

IMPORTANT! This type of calibration *accounts only for static draft at the time of the calibration*. Be mindful of events that may affect your draft and recalibrate as needed!

A draft sensor may also be installed at the location of the trunnion and calibrated relative to the static water line to monitor dynamic draft

- **Cutter suction dredge** configurations include a pressure sensor with a vertical offset from the trunnion to the keel.
- **Hopper dredges**, due to their ever-changing loads, require draft sensors to update the vessel draft in real time.

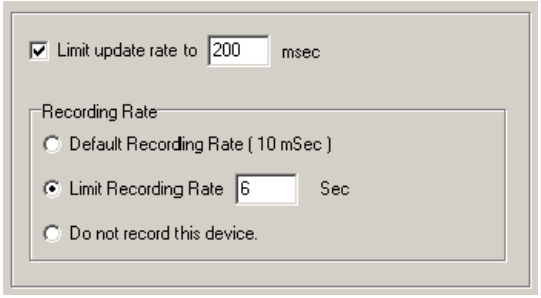
LOGGING DATA IN DREDGEPACK®

The DREDGEPACK® program logs HYPACK® Raw format data files and repaints the matrix cells.

The **matrix** is painted according to the criteria set in the matrix options.

The **raw format files** contain the time, tracking point, location of the cutting tool and the depth of the cutting tool at time intervals defined in the Advanced tab in HYPACK® HARDWARE.

FIGURE 9-18. *Setting the Recording Rate in HYPACK® HARDWARE*



The **Recording Rate** is the rate (in seconds) at which DREDGEPACK® records values for the device while logging. The default rate is 10 msec.

Since dredges are typically slow-moving, the default recording rate of one record every 10 msec can be excessive. For example, the Vulcan driver expands the area of the matrix that will be painted by any one sounding. You need an update rate fast enough to assure accurate painting of the matrix, but if you also stored the soundings in raw files, you would rapidly accumulate data that is excessive for the slow speed of a dredge.

You can reduce the size of the raw data file and still maintain sufficient records of your work by slowing the recording rate. It is up to you (or your job specifications) to determine the appropriate rate.

PROJECT INFORMATION IN DREDGEPACK®

The project header data, which is written to the header of the raw data files, is defined in the project information. The header data is optional, (for display purposes only) but a year from now you may be thankful that somebody took the time to fill out the available fields.

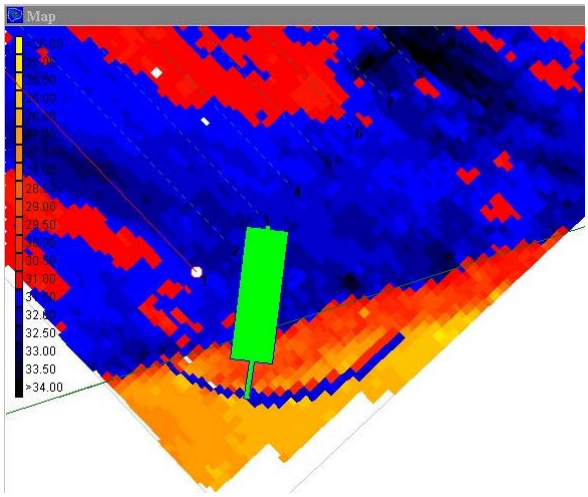
More Information

- "Project Information in SURVEY" on page 3-73

MATRIX FILES IN DREDGEPACK®

Matrix files (*MTX) are gridded rectangular areas. You can fill the cells with depth information from your echosounder or dredge cutting tool in real time during data collection, or in post-processing.

FIGURE 9-19. *A Matrix File in the Map Window of DREDGEPACK®*



Filled Matrices can be used in DREDGEPACK® to monitor dredging progress and to compare pre-and post-dredging depths. Matrices used in this manner can also be displayed in the HYPACK® design window showing "As Surveyed" data, "As Dredged" data or the difference between the two depths. DREDGEPACK® has the same display options and can also display the difference between the channel and the matrix depth.

Matrix files can be saved at even time intervals by setting a Matrix Backup Time in the navigation parameters.

NOTE Be aware that there are limits to the maximum size of a matrix that can be successfully used in SURVEY. The maximum size depends on the amount of RAM, free hard drive space and processing power on your computer. Users with very large project areas should consider creating multiple matrices.

One of the first steps before beginning the digging operation is to transfer your pre-dredge survey data into a matrix. This allows you to display the color-coded depth information while digging, changing the colors based on the depth of the digging tool as it passes through each cell.

The DREDGEPACK® program logs HYPACK® raw format data files and repaints the matrix cells, according to the criteria set in the matrix record options. The raw format files contain the time, tracking point, location of the cutting tool and the depth of the cutting tool at user-defined intervals. Matrix files can be saved at even time intervals by setting a Matrix Backup Time in the navigation parameters.

Typically, the matrix cells are color-coded, one-at-a-time, as your cutting tool passes through the corresponding location. In most cases, the user-defined matrix options determine the depths stored in the matrix. However, if your hardware configuration includes the Vulcan driver, it is possible to fill multiple matrix cells at once.

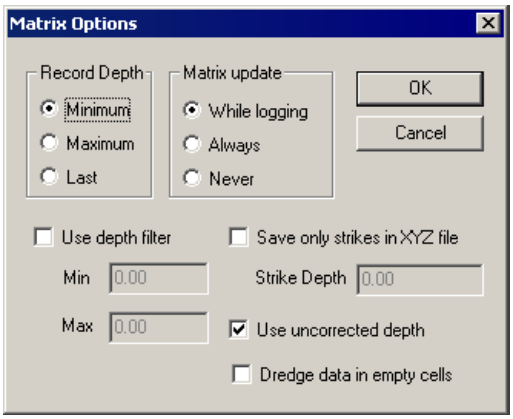
More Information

- "Creating a Matrix File with the Matrix Editor" on page 2-254
- "Matrix File View Options in HYPACK®" on page 2-255
- "Matrix Files in Survey" on page 3-52

MATRIX RECORD OPTIONS IN DREDGEPACK®

The soundings you record to the matrix will be saved according to the criteria set in the matrix options. Select MATRIX-OPTIONS and the Matrix Options dialog will appear.

FIGURE 9-20. Matrix Options Dialog



Record Depth determines the depth reading to be stored to each Matrix Cell. Note how they are affected by Elevation or Depth Mode that you have set in the Matrix Menu.

Minimum will record the smallest depth value received in that cell.

- **In Depth Mode**, , the smallest value is at the shoalest point.
- **In Elevation Mode**, the smallest value is at the deepest point.

Maximum will record the largest depth value received in that cell.

- **In Depth Mode,** the largest depth is deepest, while the smallest depth is shoalest.
- **In Elevation Mode**, the largest depth is shoalest, while the smallest depth is deepest.
- **Last** will record the last sounding received.

Use Depth Filter option can be used to eliminate depths outside a user-defined range (Min Depth to Max Depth) from being saved to the matrix. This function can be used in either Depth or Elevation Mode. Since soundings are output as positive values, the Min. and Max values are always positive and the depths saved will fall in that range.

Save only strikes in XYZ file: When you select MATRIX-SAVE TO XYZ, it saves the difference between the sounding value and the user-defined Strike Depth. This is useful to see how much must be dredged to level the area to the strike depth.

- **If selected in depth mode**, it only saves sounding if the Z-value of the As Dredged Depth is less than the Strike Depth. In this case, it saves the difference of the Strike Depth minus the Z-value of the As Dredged Depth
- **If selected in elevation mode**, it only saves sounding if the Z-value of the As Dredged Depth is greater than the Strike Depth. In this case, it saves the difference of the As Dredged Depth minus the Z-value of the Strike Depth
- **If unselected**, this option saves all depths.

Beware!

BEWARE! This function is influenced by the Elevation Mode setting. If you are in Elevation Mode, this will record depths deeper than the strike mode. Probably not a very useful set of data!

You may also choose a Matrix Update Basis. You can choose to update your Matrix as follows:

- **Always** updates your Matrix continuously. This option enables you to follow your dredging in the Matrix while not recording the Raw data if you don't need it.
- **While Logging** updates your Matrix only when you are logging Raw data.
- **Never** causes the program not to update the Matix with "As Dredged" depths.

Use Uncorrected Depths: The Matrix is updated, by default, with corrected depth information. If your device outputs corrected data, check 'Use Uncorrected Depths' to avoid double corrections in the matrix.

Dredge Data in Empty Cells: This option, available only in DREDGEPACK®, enables you to paint matrix cells in DREDGEPACK® even if they contain no survey data. Use this option to paint an empty matrix or when you are working beyond the filled area of the matrix.

We suggest that you configure your dredge display as follows:

- **Matrix Options:** In the shell menu, select MATRIX- OPTIONS and set **Record Depth** to Maximum values when you are working in Depth Mode, (Minimum when you are in Elevation Mode)
- **In the Area Map window**, select MATRIX-DISPLAY OPTIONS and opt to show dredge data.

With these settings, as the cutting tool passes over each cell, it determines the cell over which the cutting tool is positioned. If the depth of the cutting tool is deeper than the previous 'As Dredged' depth or the 'As Surveyed' depth for the cell, it saves the depth of the cutting tool to the 'As Dredged' data set. The screen displays either the 'As Surveyed' depth (if it is greater than the 'As Dredged' depth) or the 'As Dredged' depth (if it is greater than the 'As Surveyed' depth. This provides the operator with a useful graphic to determine areas that remain to be dredged to achieve the project depth.

Alternatively, in the display options, you may choose to view the difference between the "As Surveyed" depths and the "As Dredged" depths. This shows how much material has been added or removed during dredging.

Expanding Matrix Cell Coverage with the Vulcan Driver

The Vulcan driver expands cell coverage based on the dimensions entered in the device setup. Set the bucket dimensions and the spacing of your soundings. As you dredge, multiple soundings will be recorded over the area of the bucket. Any matrix cell touched by any part of the bucket area

will be color-coded according to the bucket depth. The mobile number is the number of the bucket mobile.

FIGURE 9-21. *Vulcan Driver Setup*

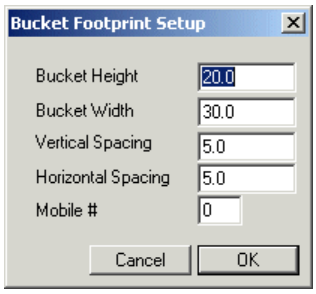
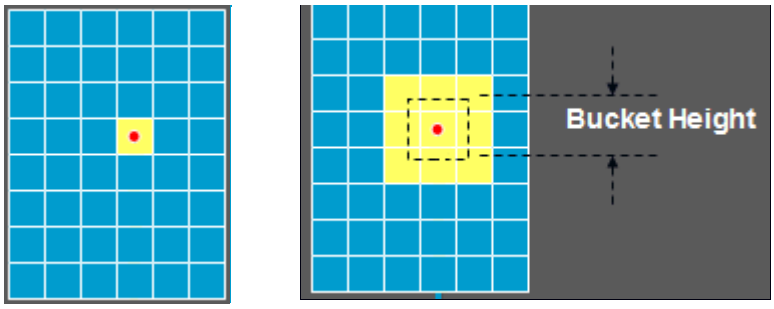


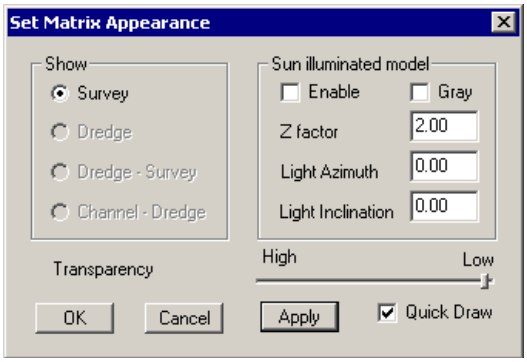
FIGURE 9-22. *Matrix painting—Without the Vulcan.dll (left)*With the Vulcan.dll (right)



MATRIX DISPLAY OPTIONS

The matrix files in each area map can be independently configured.

FIGURE 9-23. *Set Matrix Appearance Dialog*



The **Show** Options: In SURVEY, the only option is to display the survey depths. The remaining options are enabled only in DREDGEPACK®.

Matrix files have two depth fields, one for the pre-dredge survey depths and the other for dredge depths. This allows you to choose for the matrix to be color-coded according to any of the following values:

- **Survey** displays the 'as surveyed' depths
- **Dredge** displays the 'as dredged' depths

- **Show Dredge-Survey** displays the difference between the ‘as surveyed’ and ‘as dredged’ depths.
- **Channel-Dredge:** Shows the difference between the dredge depth and the channel template.

NOTE These settings *do not affect the values that are stored in the matrix*. They are for display purposes only. You can change them at any time.

Sun Illuminated Model Options: When you enable these options, the matrix will be displayed as a gray-scale solid TIN Model with a virtual light source that can be repositioned to accentuate the contours of your surface model.

- **Z-factor** multiplies the depth values to exaggerate or flatten the surface contours.
- **Light Azimuth** is the horizontal angle of the light source relative to the matrix.
- **Light Inclination** is the vertical angle of the light source relative to the matrix.

The **Transparency** option allows a user-defined transparency of the matrix in order to see displays, such as charts, that are drawn beneath it. The following figures show the matrix at varying levels of transparency.

FIGURE 9-24. *Transparency equal to 0*

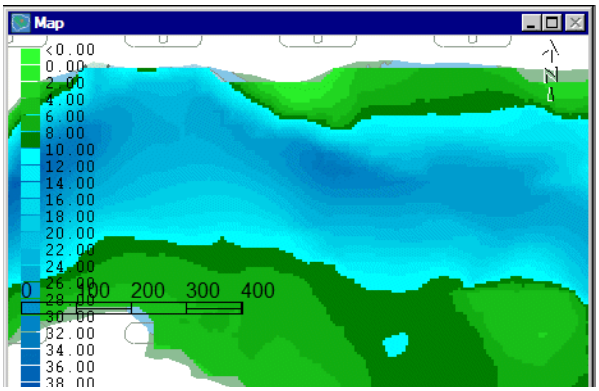


FIGURE 9-25. *Transparency equal to 1*

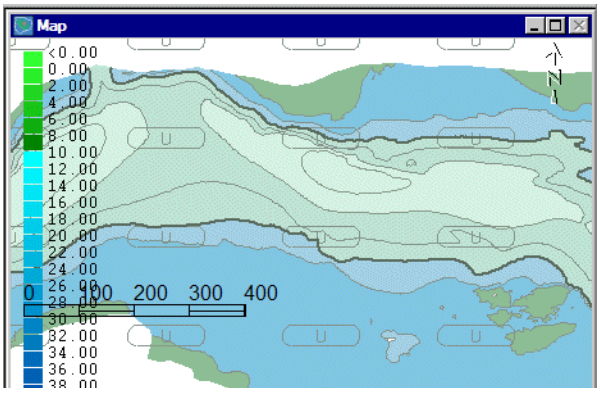
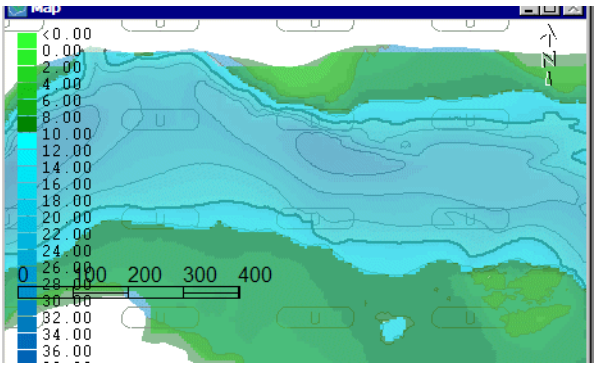
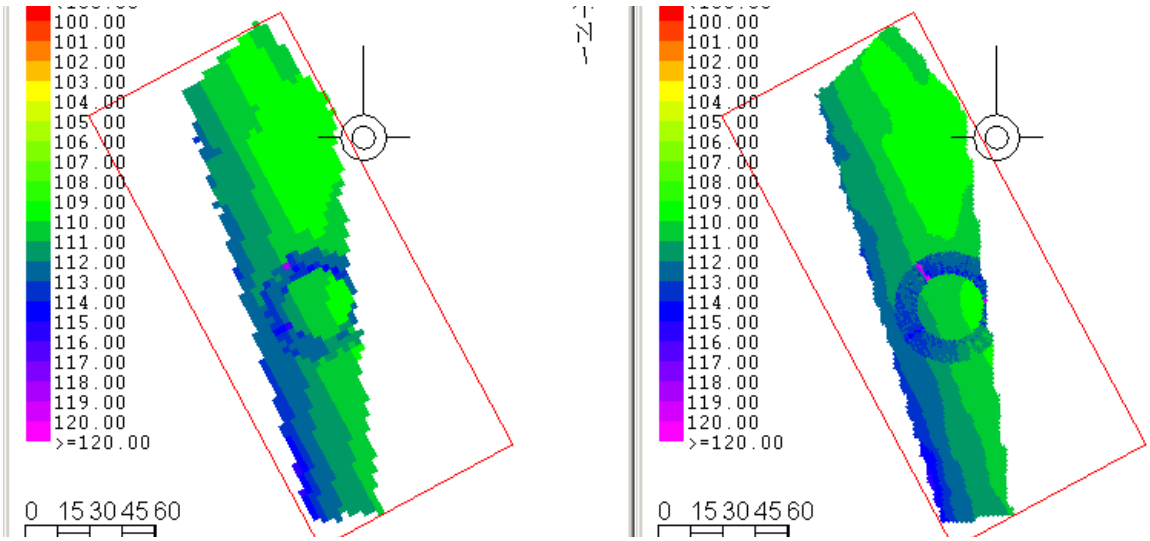


FIGURE 9-26. *0.4 (or 40%)*



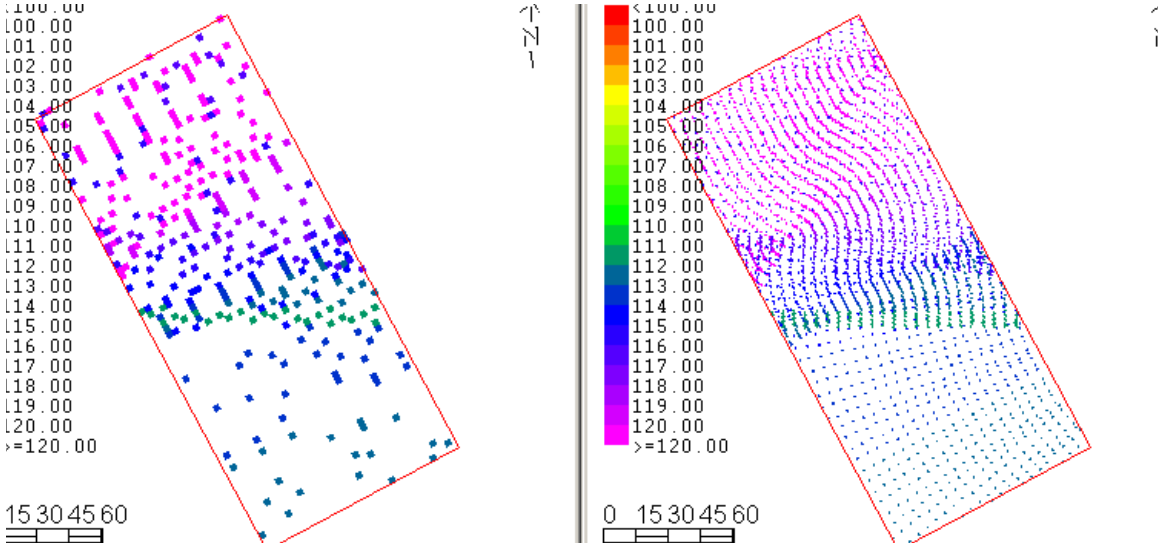
Quick Draw: It can use a lot of your CPU resources to draw and update filled matrix files in your Area Map display and, in some cases, this may interfere with recording your data. When you check this option, SURVEY uses a drawing routine that is less detailed at large zoom scales, but nearly undetectable when you zoom in. This frees your computer resources to log your data.

FIGURE 9-27. *Quick Draw (left) vs Regular Drawing (right)*



This option does not always provide a good representation of your data in matrix files that are sparsely populated.

FIGURE 9-28. *Quick Draw (left) vs Regular Drawing (right)*

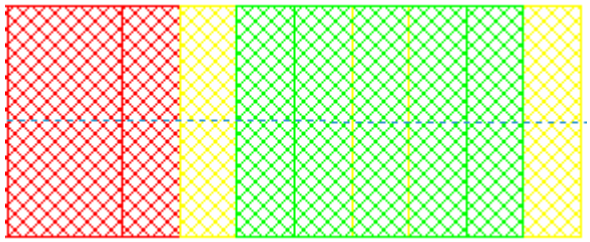


TIP: You can temporarily uncheck the Quick Draw option and click [Apply] to quickly view the more accurate display, then reapply the Quick Draw option as you continue logging data.

BUCKET PATTERNS IN DREDGEPACK®

If you are using a bucket dredge, you can display bucket patterns. This option can be helpful in tracking your coverage and in achieving optimal bucket placement.

FIGURE 9-29. *Sample Bucket Patterns*



There are two distinct uses for bucket dredges:

- **Dredging** to remove material. Click F3 each time your bucket reaches the bottom and your project depth colors will be used to color-code bucket foot-prints according to the depth and orientation of your bucket.

- **Capping** puts material down. Click F3 each time you drop material to track the number of drops at each position.

In both applications, the location of the previous bucket gives you a visual reference with which to control the next placement.

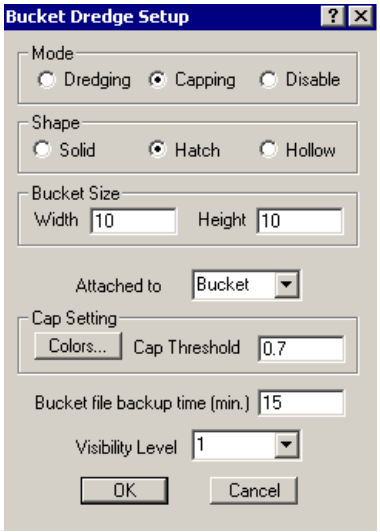
A Bucket file (*.BKT) is automatically created in your project each day you work with bucket patterns. By default, bucket files are named *Date*.BKT All of the bucket footprints created in any one day are saved to the day's file. It can be displayed in the area map of DREDGEPACK® and in HYPACK®. They can be automatically saved at even time intervals by setting a bucket file backup time in the Bucket Setup Dialog.

DISPLAYING BUCKET PATTERNS IN DREDGEPACK®

When you launch DREDGEPACK®, all bucket files that are enabled in HYPACK® will be loaded as a background chart. The display of each file can be turned on and off through the map menu.

Before you begin to log data, you must set your Bucket Options. Select OPTIONS-BUCKET PARAMETERS to access the Bucket Dredge Setup dialog.

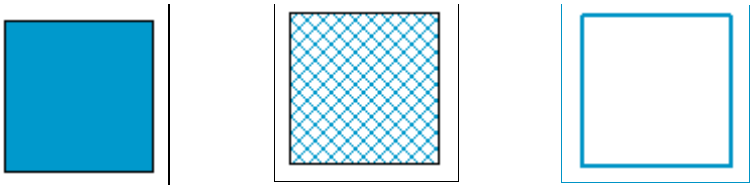
FIGURE 9-30. *Bucket Dredge Setup Dialog*



Mode tells DREDGEPACK® whether you are dredging or capping. The *Disable* option suspends this display.

Shape describes the fill pattern of the footprints displayed on the screen.

FIGURE 9-31. *Bucket Display Options--(left to right) Solid, Hatch and Hollow*



Bucket Size determines the dimensions of the footprint displayed.

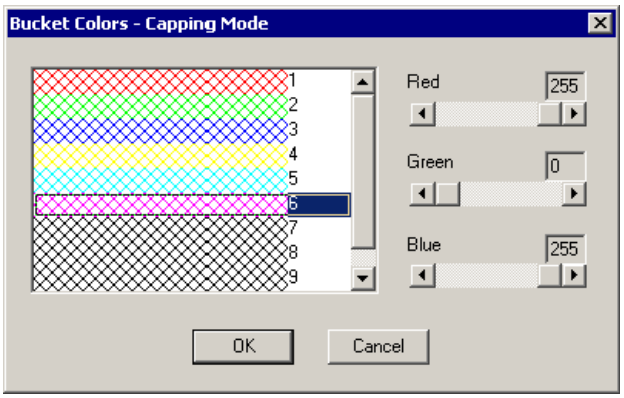
Attached To: Designate the mobile on which the digging tool resides. This tells DREDGEPACK® to mark the bucket at the bucket position rather than at the tracking point of the main vessel, which is typically on the barge.

Cap Setting: In Capping mode, DREDGEPACK® tracks the number of drops at each location so you know you have achieved even coverage of an area. If you know the *approximate* change in depth for each drop, you can also *estimate* how much you have added to any location.

It is also used in Capping mode to determine which color footprint to draw. The footprint colors at each location will be incremented with each drop according to the colors in the Bucket Colors dialog and the user-specified Cap Threshold.

[Colors] accesses the Bucket Colors dialog. Select each color on the left and customize your color scheme using the sliders on the right.

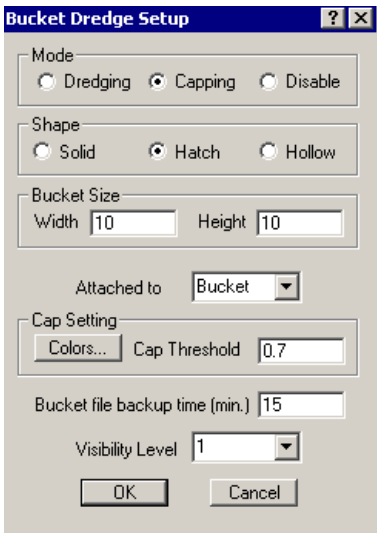
FIGURE 9-32. *Bucket Colors Dialog*



The **Cap Threshold** defines the amount one bucket footprint must overlap another before DREDGEPACK® will increment the color. Currently, it is not based on the footprint *area*, but on the distance between the footprint center points.

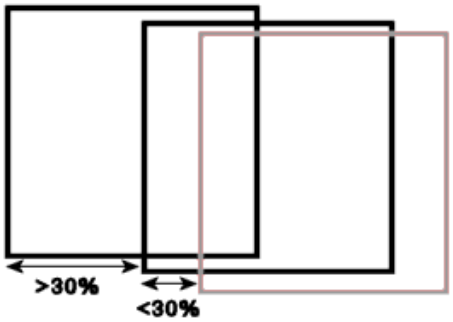
An example will help to illustrate how this all works. We will use the settings as in the following figure (bucket size = 10 x 10 and Cap Threshold = 0.7). The color will increment if the bucket center is more than 3 units (1-0.7=0.3 which is 30%) offset from the center of all previous bucket footprints in that area.

FIGURE 9-33. *Bucket Dredge Setup Dialog*



The first bucket dropped at any position will display a Color 1 footprint. After that, as long as the position of the bucket center for each drop is greater than 3 units (approximately 70% overlap of the bucket as indicated by the Bucket Threshold) away from any other, each of those footprints will also be Color 1. If any subsequent bucket is dropped *less than* the threshold distance of the bucket width away, the footprint will be Color 2. A third drop within a half-bucket width of the same location will draw in Color 3.

FIGURE 9-34. *From left to right: -The first bucket is color1. The second bucket is more than 30% offset so it is still color 1. -The third bucket is offset less than 30% from the second, so it is color2.*



Bucket File Backup Time instructs DREDGEPACK® to automatically save your Bucket file at even time intervals as you work. This prevents loss of excessive data if, for some reason, your system goes down.

Visibility: If you generate bucket patterns regularly, over time, your display is likely to become cluttered with them. You can manage how much of the current day's bucket record is displayed on the screen using the visibility setting and the Clear Bucket icon.

In the simplest scenario, all of the bucket patterns are removed *from the display* by a simple click of the Clear Bucket icon. The records remain in

the day's BKT file. This scenario would be accomplished by entering 1 in the Visibility field. Continue reading and it will become clear why.

Consider a more complex scenario. Let's say you are working long days, but you want to see only the patterns from the last three hours. You begin working and, when you get to the four-hour mark, you would like to remove the records from the first hour. With the Visibility setting at 1, the whole display will clear. A solution might be to set your Visibility to 3 and click the Clear Bucket icon at the start of each hour. Here's how it works.

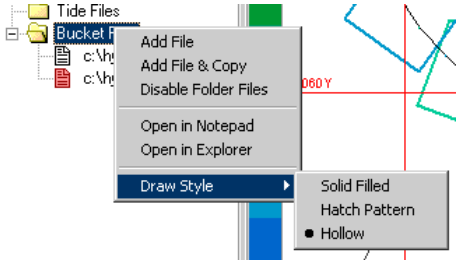
Imagine your display has layers. When you start to work at the beginning of the day, the bucket pattern you create draws to the screen on Layer 1. When you click the Clear Bucket Icon, they move down to layer 2, leaving Layer 1 clean. Each time you click the icon, your patterns all shift downward one layer leaving Layer 1 blank for subsequent patterns. The Visibility option determines how many layers remain displayed in DREDGEPACK®.

In our example, the dredge operator wanted to see no more than three hours' data. By clicking the icon every hour, at the beginning of the fourth hour, the patterns from the first hour will advance to the fourth layer. With visibility set to 3, it will no longer be displayed. The records from the second and third hours will be on layers 3 and 2 respectively and will remain displayed.

DISPLAYING BUCKET FILES IN HYPACK®

Bucket files are listed in the Project Files list in the HYPACK® screen. Enable or disable them, as any other file type, to control whether they are drawn to the map area.

FIGURE 9-35. *Setting the Bucket Pattern*



Note: While most files enabled in HYPACK® are loaded and displayed in DREDGEPACK®, Bucket files may only be drawn to the DREDGEPACK® screen according to the Bucket History and Bucket Today options in the DREDGEPACK® Map menu.

You can also choose the design of the footprint by right clicking "Bucket Files" and selecting "Draw Style". You have the same options (solid, hatch pattern or hollow) as in DREDGEPACK®.

Bucket patterns can also be converted to DXF files in the EXPORT program, then displayed as background charts in HYPACK®.

DREDGE VOLUME ESTIMATES

HYPACK® features with which you can view approximations of your dredge volumes.

- You can configure your **Data Display window** to display estimated values in real-time as you dredge.
- **The Matrix Reporter** compares the data in your project matrix over time and derives estimates of the volumes removed each time you update the reporter.

IMPORTANT! *These are only estimates.* A detailed hydrographic survey with precise depth measurements must be performed to calculate the true amount of material that has been removed. HYPACK® makes accurate volumes calculations only in the CROSS SECTIONS AND VOLUMES or TIN MODEL programs.

REAL-TIME VOLUME ESTIMATES IN DREDGEPACK®

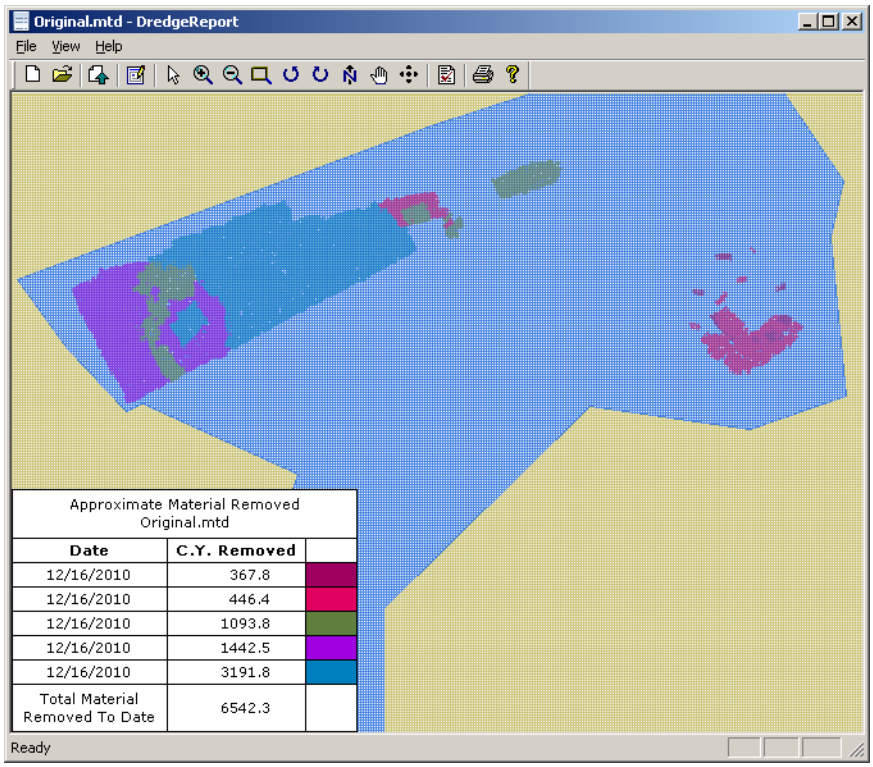
Real-time volume estimates, calculated from the difference between the 'As Dredged' and 'As Surveyed' surfaces, is available in the Data Display window. Select CONFIGURATION-DREDGE.

- **Volume Up:** The amount of material in the 'As Dredged' surface that lies above the 'As Surveyed' surface.
- **Volume Down:** The amount of material in the 'As Dredged' surface that lies below the 'As Surveyed' surface.
- **Area Up** estimate the area of the 'As Dredged' surface above the 'As Surveyed' surface respectively.
- **Area Down** estimate the area of the 'As Dredged' surface below the 'As Surveyed' surface respectively.
- **Partial Volume Up/Down** and **Partial Area Up/Down**: These values are calculated in the same manner as the full values just defined with one exception: The values can be restarted by selecting MATRIX-RESET PARTIAL COUNTERS. You can use this option , for example, at the start of each shift or each day, to monitor your progress over shorter spans of time than the entire project.

DREDGE VOLUME ESTIMATES IN THE MATRIX REPORTER

The MATRIX REPORTER tracks the changes in your dredge matrix over multiple days and, for each day, it displays color-coded areas indicating where work has been done for the day and provides a rough estimate of the amount of material removed. Print the report as required.

FIGURE 9-36. *MATRIX REPORTER Interface*



To track the changes, the MATRIX REPORTER builds a database from the data in the pre-dredge survey matrix. Typically, you will use the same matrix to record your dredging progress each day and, at the end of each day or each shift, you will load it to the MATRIX REPORTER. The program records the new data to the database and compares the new data to the data from the previous update.

IMPORTANT! *This is only a rough estimate; it is not a volume!* This estimate is based upon the depth of a cutting tool as it traveled through the matrix. It is possible to lower the tool and pass it through the material without actually removing material so this cannot be used as a volume.

More Information

- "Running the MATRIX REPORTER" on page 9-35
- "View Options in the MATRIX REPORTER" on page 9-36

RUNNING THE MATRIX REPORTER

1. **Configure the HYPACK®area map display and save your project.** This gives you a geographical frame of reference in the MATRIX REPORTER. The MATRIX REPORTER only displays project files enabled in the HYPACK® area map. When you save the project, your settings are written to the project *.INI file where the MATRIX REPORTER can read them.

   NOTE: Due to the way the MATRIX REPORTER draws the matrix database, the zoom extents tool in the MATRIX REPORTER acts only on the project files. All other zoom and pan tools work as expected.

   ---

2. **Open the MATRIX REPORTER** by selecting UTILITIES-DREDGING UTILITES-MATRIX REPORTER.
3. **Build your pre-dredge database**.
   a. **Select FILE-NEW DATABASE.** A File Open dialog will appear.
   b. **Select your pre-dredge survey matrix and click [Open].** The database file will be generated and named using the root name of the pre-dredge matrix and an MTD extension.

      The MTD file name will appear in the MATRIX REPORTER title bar.
4. **Work in your project area, updating the pre-dredge matrix** (or a copy) with your 'As Dredged' data.
5. **After each day of dredging, update your database using the matrix with your 'As Dredged' data** (the 'working matrix').
   a. **Select FILE-ADD UPDATE.** A File Select dialog will open
   b. **Select your working matrix and click [OK].**

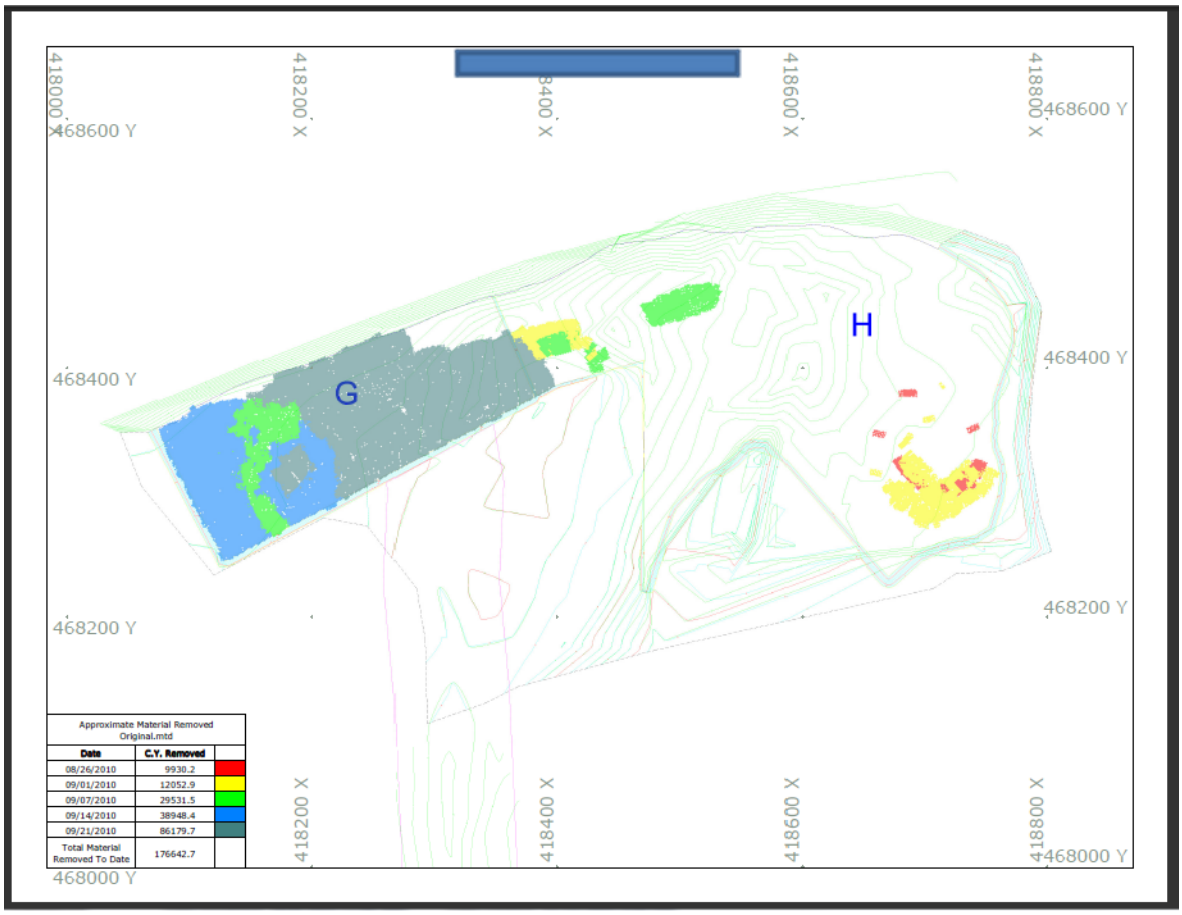
   NOTE: The matrix file used for the update must have the same position, rotation and cell dimensions as the one used to generate the database. This is good reason to dredge with the same matrix file with which you built your database.

   ---

6. **Configure your display** in the Manage Updates and Program Options dialogs.
7. **Print your report** (optional).

a. **Configure your printer** by selecting FILE-PRINT SETUP and setting your printer options.
b. **Preview your printed report** by selecting FILE-PRINT PREVIEW.
c. **Select FILE-PRINT**.

FIGURE 9-37. *Sample Final Report*



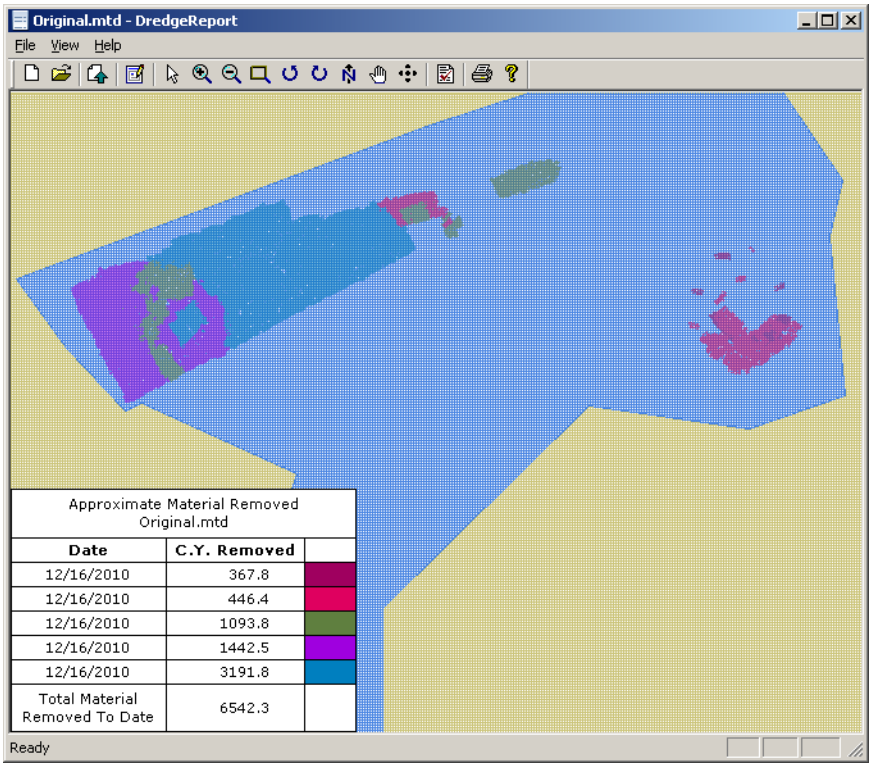
More Information

- "View Options in the MATRIX REPORTER" on page 9-36

VIEW OPTIONS IN THE MATRIX REPORTER

Once you are in the MATRIX REPORTER program, you can not change the files that are drawn behind your matrix database display, but there are a few tools for you to customize your display.

FIGURE 9-38. *Sample MATRIX REPORTER Display*



Zoom and Pan Tools

The MATRIX REPORTER includes a toolbar with the standard set of zoom and pan tools.

Zoom In/Out: When this option is selected, a left-click decreases the scale (zoom in) and a right-click increases the scale (zoom out).

Zoom Window: Select this option and drag a rectangle in the window to define the extent of your desired view. The program will redraw the screen to display the defined area optimally.

Zoom Extents: When this option is selected the screen will be drawn at a zoom scale that displays all enabled data.

Pan: Select this option, then click in the window at the point around which the display should be centered. The display will redraw accordingly.

> **NOTE:** Due to the way the MATRIX REPORTER draws the matrix database, the zoom extents tool in the MATRIX REPORTER acts only on the project files. All other zoom and pan tools work as expected.

Manage Updates Dialog

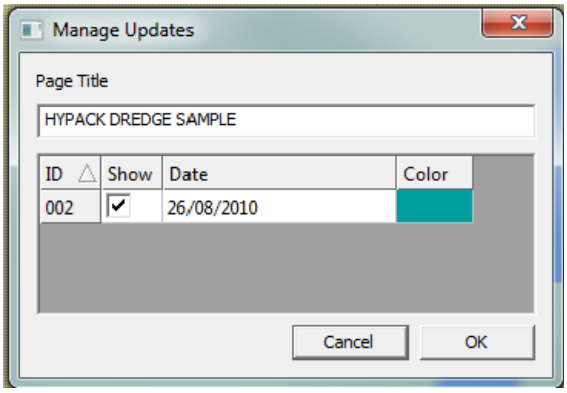
In the Manage Updates dialog you can configure your report as follows:

- Add a title to the page,
- Change the color assigned to any update,

- Change the date of any update
- Choose the dates for the graphical display.

To access the Manage Updates dialog, select FILE-MANAGE UPDATES (Ctrl + E).

FIGURE 9-39. *Manage Updates Dialog*



To add a title to your matrix report, enter it under 'Page Title'.

To edit the update colors, click in the color box you want to change and select a new color from the Colors dialog.

To edit the dates of the update data, just enter the new date on the update record.

To choose the dates for the graphical display, use the check boxes in the 'Show' column. All checked records will be included on the map.

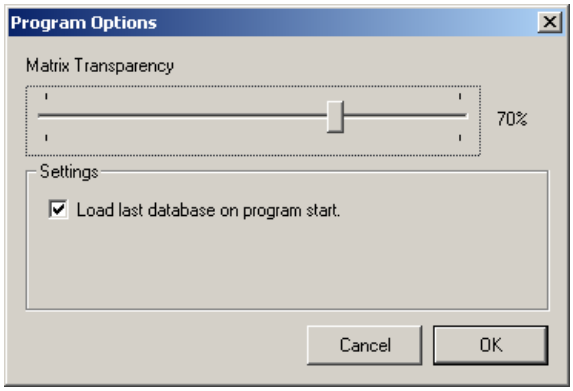
NOTE: When an update is hidden, it will not display on the map but *the Total Material Removed Estimate will include all of the dates in the database.*

Program Options Dialog

The Program Options dialog controls the total drawing.

To access the Program Options dialog, select VIEW-OPTIONS (Ctrl+Q).

FIGURE 9-40. *Program Options Dialog*



Matrix Transparency: With the slider set somewhere in the middle the program draws the matrix database in such a way that you can see through the database information to the project files beneath. A setting of 100% draws an opaque database; 0% makes your database invisible, defeating the purpose of the program.

'**Load last database on program start**' instructs the program to open the database where you left off in the previous session. If you check this option, at the end of each day all you have to do is open the program and update the matrix database. Otherwise, you will have to load the database manually each day.

To open an existing database, select FILE-OPEN DATABASE and select the required MTD file.

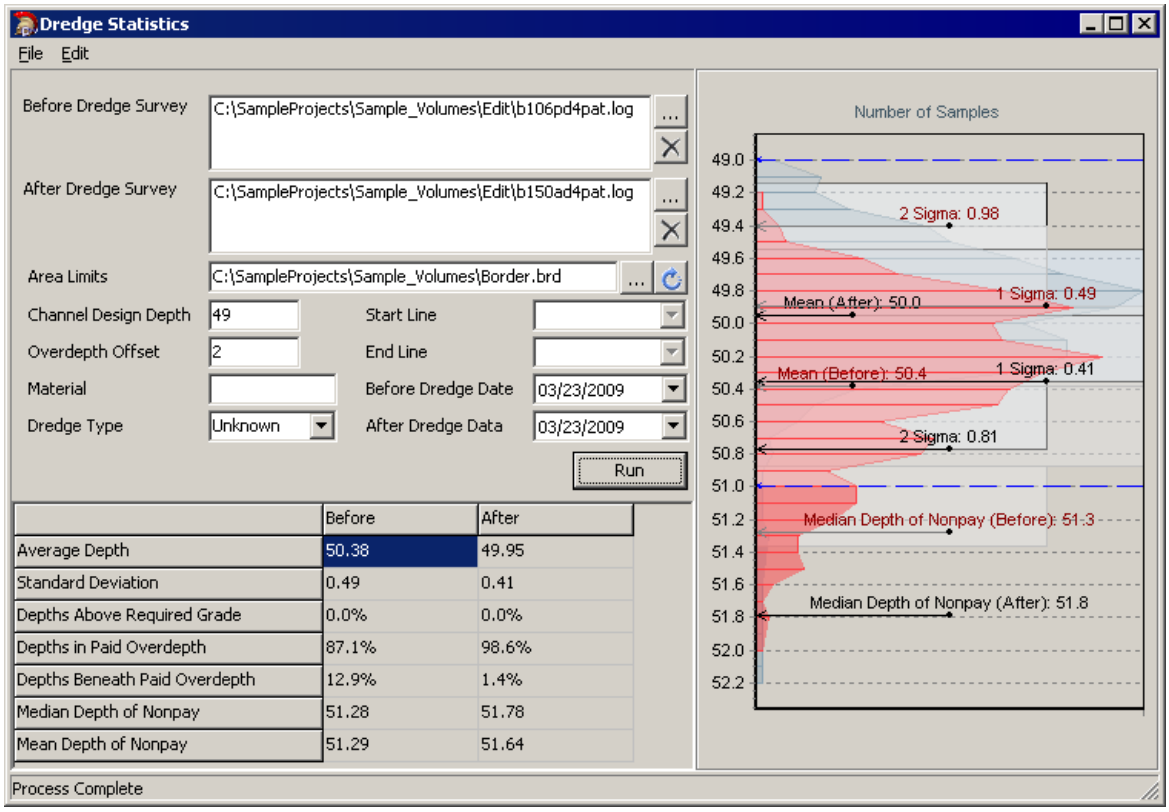
DREDGE STATISTICS

DREDGE STATISTICS calculates the statistics to show how many final depths in a data set are above and below a user-specified depth within a given area. The program accepts one or two data sets and compares them against the user-defined project depth. Data is only compared in the main channel; the depths on the side slopes and outside the main channel are ignored.

CALCULATING DREDGE STATISTICS

1. **Access DREDGE STATISTICS** by selecting UTILITIES-DREDGE UTILITIES-DREGE STATISTICS. The DREDGE STATISTICS window will appear.

FIGURE 9-41. *Sample Dredge Statistics*



2. **Enter your survey data.** The program supports edited All format, XYZ, or HSX files. Click the [...] and select your file.
3. **Define the area where statistics should be calculated.** Under Area Limits, load any of the following file types:
   - **A matrix file (*.MTX)** defines a rectangular area.
   - **A line file (*.LNW)** defines the area covered by the lines. You may further define the limits by entering a pair of lines--the Start Line and End Line--between which the statistics will be calculated.
   - **A border file (*.BRD)** allows you to define an irregularly shaped area.
4. **Set the Design Depth.** Thisis the level to which you are comparing your data. If you define your area limits with a three-dimensional line file, the program will automatically read the design depth from the line file template information.
5. **Define the Overdredge Offset. This** is the distance between the design depth and the overdredge depth.
6. **Click [Run]**. The program calculates the following statistics:
   - Mean Z-Value
   - 1-sigma and 2-sigma values based on Z-values.
   - % of Depths Above Design Depth

- % of Depths In Overdepth Region
- % of Depths Beneath Overdepth Region
- Mean and Median Depths Beneath Overdepth Region.

DREDGE STATISTICS shows the calculated statistics in a table as well as in a distribution graph. If two datasets are provided, the pre-dredge information is drawn in red and the post-dredge in blue so you can visually compare the data.

DREDGE STATISTICS REPORTS

DREDGE STATISTICS can store the statistical data to a text file or produce a printed report of the data and the distribution graph.

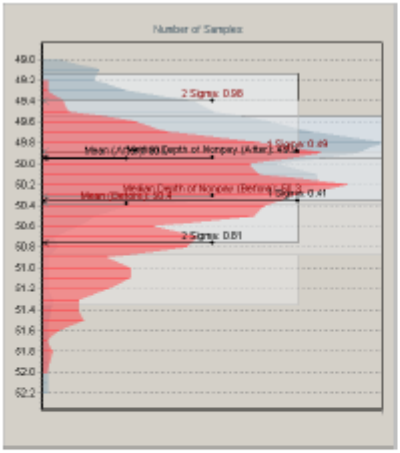
Text Reports

You can record the results of any set of calculations DREDGE STATISTICS to a Comma Separated Value (CSV) file which can easily be read by a text editor or spreadsheet program. The file is generated when the first set of calculations is recorded. Subsequent calculations can be appended to an existing CSV file or stored as the first record of an additional file.

Print Reports

You can also print a report that presents all of the information from the DREDGE STATISTICS interface in a printer friendly format.

FIGURE 9-42. *Sample DREDGE STATISTICS Print Report*



Date:	10/29/2009
Before Dredge Survey Data:	b106pd4pat.log
After Dredge Survey Data:	b150ad4pat.log
Area Limits File:	Border.brd
Channel Design Depth:	40.00
Overdepth Offset:	2.000
Material:	
Dredge Type:	Unknown
Start Line:	
End Line:	
Before Dredge Date:	3/23/2009
After Dredge Date:	3/23/2009

	Before Dredge	After Dredge
Number of Soundings:	590	568
Number Above Required Grade:	0 (0.0%)	0 (0.0%)
Number In Paid Overdepth:	0 (0.0%)	0 (0.0%)
Number Beneath Paid Overdepth:	590 (100.0%)	568 (100.0%)
Average Depth:	50.4	50.0
Standard Deviation:	0.49	0.41
Median Depth of Nonpay:	50.3	49.9
Mean Depth of Nonpay:	50.4	50.0

CHAPTER 10

Appendix

DATA FILE TYPES

There are a few different formats in which HYPACK® stores data.

File Extension	Purpose
***.ADCP**	Water current data from and ADCP device saved together with position and depth data from HYPACK® SURVEY to HYPACK's custom format.
RAW	**Raw files** are the data files that result from the SURVEY or DREDGEPACK® program. Every time you go "On Line", a new "Raw" data file is created. They are ASCII format files that contain the header information and time-series information for each survey device. By default, they have the extension "*.RAW" and, in a standard HYPACK® project, are stored in the \Hypack\Project\Raw directory. You may choose a naming format or an alternate directory (or both) in the SURVEY program under OPTIONS-PROGRAM INFORMATION. A list of individual data files is provided in a Catalog (*.LOG) file. You can quickly draw or process a group of files by specifying the *.LOG name, instead of entering the name of each data file. RAW format files are read through the SINGLE BEAM EDITOR where they are merged with Tide and other corrections and are written as Edited All format files
ALL	ALL format files are ASCII files created in SINGLE BEAM EDITOR from Raw single beam data. They contain the position information, raw depths, time, correction and raw position data for every sounding. HYPACK® creates an ALL format file for every survey line.
***.HS2**	Multibeam survey data files, edited in the HYSWEEP® EDITOR. This is a binary format
***.HSX**	HYSWEEP® SURVEY Raw data files. They are read and edited in the HYSWEEP® EDITOR. Edited data files of multibeam and multiple transducer data are stored in a binary format (HYPACK® "HS2" Format) or the ASCII XYZ or SWP formats.

File Extension	Purpose
***r.000**	Water current data from and ADCP device saved to RD Instruments' format.
***.SEGY**	Sub-bottom profile data. This is binary data which SURVEY records, in tandem, with a HYPACK® Raw file. They are processed together in the SUB-BOTTOM PROCESSOR where you can digitize the depth layers of the SEGY files and save them to HYPACK® ALL2 format files.
***.SWP**	Sweep Format File: This is a binary file of edited multibeam or multiple transducer data. It is created in the HYSWEEP® EDITOR program and can be read into the MAPPER program.
***.XYZ**	HYPACK® can create ASCII XYZ format files in the MAPPER, SORT and REFORMAT programs. Xyz files can be read and displayed in the Main window. They can be used as input in the REFORMAT, MAPPER, SORT and TIN MODEL programs and can be plotted in HYPLOT. These are ASCII format XYZ files that must be named with a *.XYZ extension in order for HYPACK® to recognize them.

PROJECT FILE TYPES

HYPACK® has many types. Once you become experienced with the package, it will not be so overwhelming. The following gives a listing of file types and a brief description of each.

File Extension	Useage
***.3DM**	**3D Terrain Viewer movie file.** It contains information that, together with the corresponding XYZ data file, can replay a set of views recorded through the 3D Terrain Viewer program.
***.3DV**	**3D Terrain Viewer initialization file.**
***.3OD**	**3D Object Design File** created in the 3D SHAPE EDITOR, contains all of the information about all of the objects, their properties, etc. needed to create the *.VES file. To modify your *.VES file, you must re-open its *.30D file in the 3D SHAPE EDITOR, make your changes and export a new *.VES file.

File Extension	Useage
*.BRD	**Border Files (*.BRD):** A user-defined listing of XY positionsthat defines an area in your project area. Border files are created in the BORDER EDITOR and saved to your project directory. They have several uses: • To clip survey lines and XYZ data files to fit within a coastline or unorthometric survey area. • They may be used in SURVEY or DREDGEPACK® to edit defined areas in a matrix. • Define areas in the HYSWEEP® EDITOR where search and filter options will or will not be applied. • To limit areas where volumes are calculated in TIN MODEL or CROSS SECTIONS AND VOLUMES. • To clip TIN models.
*.CAP	**BSB version 4 charts.** These are updated and encrypted charts. HYPACK® checks for their licensing verification before it can display these charts.
*.CHN	**Advanced Channel File (*.CHN):** A channel design file contains a description of the geometry of an area. It is created in the ADVANCED CHANNEL DESIGN program and can be used in the TIN MODEL program to calculate the volume between a surveyed surface and the channel surface. A channel file can be displayed in DREDGEPACK® and MATRIX 3DTV to guide your data collection or in the HYSWEEP® EDITOR to guide the editing process.
*.COB	**Cross Section Object File** contains the text, pipeline and polyline information for a cross section graph in CROSS SECTIONS AND VOLUMES and ADCP PROFILER.
*.CSS	**Cross Section Session File** contains a list of files used in the CROSS SECTIONS AND VOLUMES program.
*.DCT	**Data Corrections Table** information used in the Sounding Adjustment program to correct Sound Velocity Correction Values. The program adds the "fixed" corrections (not interpolated values) to the current sound velocity values in edited All format data.
*.DEP	**Digitized Depth File:** A file of event marks versus depths. It is created in the ECHOGRAM digitizing program and can be used to merge depths with positions in the SINGLE BEAM EDITOR.
*.DG2	**HYPACK® chart digitized in the DG2 EDITOR.** This format replaces the DGW format with improved chart symbols and attributes available to describe your project area.

File Extension	Useage
***.DGN**	**Microstation design files version 7** can be imported into the CHANNEL CONDITION REPORTER to define the channel and the BOAT SHAPE EDITOR to convert it to an SHP file. DGN files can be plotted in HYPLOT and converted to S57 files in the ENC EDITOR and converted to LNW files using the HYPACK® DGN to LNW conversion utility.. The EXPORT program can reformat HYPACK® data to DGN format. HYPACK® does not support Microstation V8 files.
***.DGW**	**Digitized Shoreline File:** (Old Style) This is a leftover from the HYPACK® DOS days. It is a format that contains shoreline and a few simple hydrographic features. You can draw them to the screen in the Main window and SURVEY program and can plot them in the HYPLOT program.
***.DIG**	A **Digitized Shoreline Format** file created in the old SHORE MANUAL program. These files can be displayed in the HYPACK® for use with the Editor programs in the Preparations menu. They can also be displayed in SURVEY and DREDGEPACK® and can be plotted on the Smooth Sheet in the HYPLOT program.
***.DXF**	**Drawing Exchange Format:** This format is a popular CAD format, used by many CAD packages. HYPACK® can display DXF version 12 or 13 background chart files in the DESIGN and SURVEY programs and boat shapes in SURVEY and DREDGEPACK®. DXF channel files may be used by the INTERSECTOR and LNW GENERATOR to create 3-dimensional survey lines. DXF information can be imported into S57 charts in the ENC EDITOR and some DXF features may be plotted in the HYPLOT program. Several HYPACK® programs can export data to DXF format, including the REFORMAT, MAPPER, CROSS SECTIONS AND VOLUMES, and TIN MODEL programs.
***.KAP**	**BSB ver. 3 background charts.** These are unencrypted and can simply be loaded to HYPACK®. (See Also “CAP” files.)
***.KTD**	**Kinematic Tidal Datum Files (*.KTD)** are used in the SURVEY program when determining real time water levels using an RTK GPS system. Created in the KTD EDITOR, they provide information regarding the separation between the reference ellipsoid surface and the local chart datum for a large geographic area.
***.LLS**	**Combined Latitude/Longitude Shift file** used in the CORPSCON method of computing datum transformations.
***.LNW**	**Planned survey lines (*.LNW)** are used to define where you want your vessel to go. The line file contains the grid coordinates and names for each planned line in your survey area and can also contain cross section template information. Line Files are typically created in either the LINE EDITOR or the CHANNEL DESIGN program.

File Extension	Useage
*.LOG	**Catalog Files:** These files are simply ASCII lists that contain the names of data files. Almost all programs can read a Catalog File for data input.
*.MTB	**Matrix Backup** file is a binary record of the matrix of the same root name at the time of backup. It is generated by the Matrix Backup feature in SURVEY.
*.MTD	Matrix Database file is used in the MATRIX REPORTER to generate graphical displays of your project area where each day's
*.MTX	**Matrix files (*MTX)** are gridded rectangular areas. You can fill the cells with depth information from your echosounder or dredge cutting tool in real time during data collection, or in post-processing. Empty Matrix files are typically created in the MATRIX EDITOR and are saved to the project directory.
*.PLN	**Channel Plan Files (*.PLN)** are used in the creation of 3-dimensional Planned Line Files. They are created in the CHANNEL DESIGN program and saved to your project directory. Channel Plan Files contain grid coordinates for the channel centerline, left-toe and right-toe lines, and turning basins. A PLN file can also be displayed in the DREDGEPACK® profile window.
*.PLT	**Plotting Sheet Files (*.PLT)** contain origin coordinates, scale, rotation, and sheet dimensions for plotting on smooth sheets. These files are typically created in the PLOTTING SHEET EDITOR and saved with the .PLT extension to your project file. They are used by HYPLOT to define the area to be plotted.
*.RXW:	**Seabed Identification Square** in HYPACK® version 4.3 and earlier: A Seabed Identification Square is created in the SEABED STATISTICS program and used to display statistical data regarding the E1 and E2 data in All format files that contain such data. (This requires specialized echosounder equipment.) RXW format has been replaced by *.SIX files.
*.SHP	**Boat Shape File;** A Boat Shape File is created in the BOAT SHAPE EDITOR program. It can by used to display the real time boat shape in the SURVEY program. **Line and polyline shape files** available from ArcView and ArcInfo. They can be displayed in your project as background files.

File Extension	Useage
***.SIX**	**Seabed ID Square file** (version 4.3A replacing *.RXW files) created in the SEABED STATISTICS program then used by the SeabedID.dll to assign seabed ID numbers to each sounding during Survey. (This requires specialized equipment.) SEABED MAPPER reads these numbers and displays a matrix coded with Seabed ID colors and export an XYZ ID file. The EXPORT TO CAD program can also create XYZ ID files. If you have created the TIN Model using an XYZ-ID Input File, TIN MODEL will save the Seabed ID information in the Survey Depth memory of the output matrix. Depth information will be stored in the Dredge Depth memory. Seabed ID matrix files can be displayed using Seabed ID colors.
***.SWP**	**Sweep Format File:** This is an old binary file of edited multibeam or multiple transducer data. It was created in the old HYSWEEP® EDITOR program and can be read into the MAPPER or current the HYSWEEP® EDITOR programs.
***.TDX**	**Tide Table File:** This contains a list of times and tide correction heights, as entered by the user in the MANUAL TIDES program.
***.TGT**	**Target Files (*.TGT)** contain name and position information for a series of objects. You can create a target file manually, using the TARGET EDITOR then import it into the SURVEY program. This enables you to navigate *to* pre-determined locationsor *away* from areas dangerous for navigation. You can also mark targets at points of interest in SURVEY or DREDGEPACK® and save them to a target file. They can be displayed in the 3D Terrain Viewer, plotted in the HYPLOT program and exported to DXF or DGN formats using EXPORT. Target display settings are defined in the HYPACK® control panel and in SURVEY and DREDGEPACK® through the target properties and parameters.
***.TID**	**Tide Correction Files (*.TID)** are created in the HARMONIC TIDES and MANUAL TIDES programs. They contain corresponding tide and time information that can be used in the SINGLE BEAM EDITOR or the HYSWEEP® EDITOR to apply water level corrections to your sounding data. For each day included in the file, there is one correction value for every minute in the 24 hr. period for a total of 1,440 records per day. A multiday file marks the beginning of each day with its date.
***.TIN**	**TIN File:** This contains the information needed to quickly create a TIN surface model. TIN Files can only be created and read by the TIN MODEL program.

File Extension	Useage
***.TMP and *.TPL**	**Template Files (*.TPL)** created in the Template Editor of CROSS SECTIONS AND VOLUMES or the LINE EDITOR, contain the channel cross-section design information. They can be displayed in the Profile windows in SURVEY or DREDGEPACK® or used in the CROSS SECTIONS & VOLUMES program. TMP files have been discontinued to avoid confusion with Windows temporary files.
***.VEL**	**Sound Velocity Corrections** files are generated in the SOUND VELOCITY program and contain depth vs sound velocity data. They are used to correct soundings for variations of sound in the water column. In most shallow-water, small-boat surveys, the echosounder is calibrated for the range of soundings encountered and no sound velocity corrections are needed. For multibeam surveys and deep-water surveys, sound velocity corrections are used to provide more accurate soundings.
***.VES**	**Vessel File:** A 3-dimensional vessel file exported from the 3D SHAPE EDITOR and imported to the 3D TERRAIN VIEWER. It allows you to display a custom, 3-dimensional boat shape that mirrors the actual survey boat or dredge that you use while gathering data.
***.VOL**	**Volumes Report i**nformation created in CROSS SECTIONS AND VOLUMES.
***.ZEL**	The **zone edge listing (*.ZEL)** file is an ASCII text file that contains a listing of where each line crosses each zone boundary and each inflection point of the model within a zone boundary. CROSS SECTIONS AND VOLUMES reads the ZEL file for the template information and generates volume quantities based on that listing.

FILE FORMAT DESCRIPTIONS

Often, when you are checking your data or troubleshooting a problem, it is useful to open files in a text editor and examine the data. Of course, this is only helpful if you understand how the data is formatted.

NOTE: Text editors can read only data stored in ASCII text. Some of the HYPACK® survey data types are in binary format and can only be read by the HYPACK® program designed for this purpose.

RAW DATA FORMAT

Data collected by the HYPACK® SURVEY program is recorded in Raw format, one file per planned survey line. Raw files are recorded as text, allowing them to be loaded into any text editor that reads large files.

When inspecting raw files, notice the format is not tabular. That is, there is not a record for each sounding containing depth, position, tide corrections, etc. Instead, there are separate records for each device measurement and the measurements are correlated through time tags.

Every raw file contains two sections:

- **Header**, written when data logging starts
- **Data**, written as data is collected. Each record starts with a three character tag.

HEADER STRINGS IN THE RAW FORMAT

DEV STRINGS

TABLE 10-1. *Device Information*

Format	DEV dn dc "Device Name"	
Where:	dn:	device number
	dc:	device capabilities: A bit-coded field. Definitions in Table 10-2.
Sample Line	`DEV 0 100 "GPS"`	

TABLE 10-2. *Bit Definitions for the Device Capabilities*

Bit	Mask	Meaning
0	1	Device provides Range/Range positions
1	2	Device provides Range/Azimuth positions
2	4	Device provides Lat/Long (e.g. GPS)
3	8	Device provides grid positions XY
4	16	Device provides echo soundings
5	32	Device provides heading
6	64	Device provides ship speed
7	128	Hypack clock is synched to device clock
8	256	Device provides tides
9	512	Device provides heave, pitch and roll
10	1024	Device is an ROV
11	2048	Device is a Left/Right Indicator
12	4096	Device accepts annotation strings
13	8192	Device accepts output from Hypack

Bit	Mask	Meaning
14	16384	xxx
15	32768	Device has extended capabilities

DTM Strings

TABLE 10-3. Datum Transformation Parameters

Format	DTM X Y Z Rx Ry Rz	
Where:	X:	Delta X
	Y:	Delta Y
	Z:	Delta Z
	Rx:	Delta rotation on X axis
	Ry:	Delta rotation on Yaxis
	Rz:	Delta rotation on Z axis
	S	Delta scale
Sample Line	`DEV 0 100 "GPS"`	

ELL Strings

TABLE 10-4. Ellipsoid Information

Format	ELL e a f	
Where:	e:	Ellipsoid
	a:	Semi-Major Axis
	f:	Flattening
Sample Line	`WGS-84 6378137.000 298.257223563`	

EOH Strings

The **End of Header** tag indicates end of the header in each file. It has no data itself. All subsequent lines are recorded data strings.

EOL Strings

The **End of Line** tag indicates end of planned line information. It has no data itself.

FIL Strings

TABLE 10-5. File Information

Format	FIL e l	
Where	e	extension
	l	LNW file
Sample Line	`FIL "RAW" "C:\Hypack\Projects\03007NovaSB\ Intersectionfull..lnw"`	

GEO STRINGS

TABLE 10-6. Geoid Information

Format	GEO O G	
Where	O	Orthometric Height Correction
	G	Geoid
Sample Line		

HSP STRINGS

TABLE 10-7. HYSWEEP® Multiscan Survey Parameters

Format	HSP p1 p2 p3 p4 p5 p6 p7 p8 p9 p10 p11	
Where	p1	minimum depth
	p2:	maximum depth
	p3:	port side offset limit
	p4:	starboard side offset limit
	p5:	port side beam angle limit
	p6:	starboard side beam angle limit
	p7:	high beam quality; codes >= this are good
	p8:	low beam quality: codes < this are bad
	p9:	sonar range setting
	p10	towfish layback
	P11:	work units: 0=meters, 1=us foot, 2=int'l foot
Sample Line	`HSP 5.0 45.0 160.0 150.0 60 60 3 1 328.0 0.0 1`	

HVU STRINGS

TABLE 10-8. Horizontal and Vertical Units

Format	HVU h v	
Where	**h:**	Multiplier to convert horizontal survey unit to meters
	v:	Multiplier to convert vertical survey unit to meters

NOTE: Vertical survey units are always the same as horizontal survey units. Though the capability to use different survey units in each direction appears to be implemented in the GEODETIC PARAMETERS program, it is not recognized in SURVEY.

INF STRINGS

TABLE 10-9. *General Project Information*

Format	INF "surveyor" "boat" "project" "area" tc dc sv	
Where:	**tc:**	initial tide correction
	dc:	initial draft correction
	sv:	sound velocity
Sample Line	`INF "steve" "LCH 19" "mcmillen" "617.6 to 618.2" -0.7 0 1500.0`	

LBP STRINGS

TABLE 10-10. *Planned Line Begin Point.*

Format		LBP x y
Where	**x**	x grid position
	y	y grid position
Sample Line		LBP 5567222.42 3771640.72

LIN STRINGS

TABLE 10-11. *Planned Line Data follows*

Format		LIN nw
Where	**nw**	Number of waypoints
Sample Line		LIN 5

LNN STRINGS

TABLE 10-12. *Planned Line Name*

Format		LNN text
Where	**text**	line name or number
Sample Line		LNN 14

OFF STRINGS

TABLE 10-13. *Device Offsets*

Format	OFF dn n1 n2 n3 n4 n5 n6 n7	
Where	dn:	device number
	n1:	starboard, port offset. Positive starboard.
	n2	forward, aft offset. Positive forward
	n3	height (antenna) or depth (transducer draft) offset. Always positive.
	n4	yaw rotation angle. Positive for clockwise rotation.
	n5	roll rotation angle. Port side up is positive.
	n6	pitch rotation angle. Bow up is positive.

Format	OFF dn n1 n2 n3 n4 n5 n6 n7	
	n7	device latency in seconds.
Sample Line	`OFF 0 0 0 13.35 0 0 0 0.86`	

PRD STRINGS

Private Device Data has multiple formats depending on the type of device generating the data.

TABLE 10-14. *PRD - Multiple Transducer Offset*

Format	PRD dn OFF n1 n2 n3	
Where	dn:	device number
	n1:	transducer starboard offset
	n2:	transducer forward offset
	n3:	transducer depth offset (draft)
Sample Line	`PRD 1 OFF -25.60 0.00 0.40`	

TABLE 10-15. *PRD - Odom Echoscan II Multibeam Identifier*

Format	PRD dn ECHOSCN2 n1 n2	
Where	dn:	device number
	n1:	Not used
	n2:	Beam width
Sample Line	`PRD 1 ECHOSCN2 -43.5 3.0`	

TABLE 10-16. *PRD - Reson Seabat 9001 Multibeam Identifier*

Format	PRD dn sb n1 n2	
Where	dn:	device number
	sb:	SEABAT = 9001, SEA9003 , SEA8101
	n1:	Not used
	n2:	Beam width
Sample Line	`PRD 1 SEABAT -44.2 1.5`	

PRI STRINGS

TABLE 10-17. *Primary Navigation Device*

Format		PRI dn
Where	**dn**	device number
Sample Line		PRI 0

PRO STRINGS

TABLE 10-18. *Projection Information*

Format	PRO P RLon S RLat NPar SPar FE FN	
Where:	**P**	Projection
	RLon	Reference Longitude
	S	Scale
	RLat	Reference Latitude
	NPar	North Parallel in radians
	SPar	South Parallel in radians
	FE	False Easting
	FN	False Northing
Sample Line	`PRO TME xxxxx -111.000000 0.999600 0.000000 0.000000 0.000000 500000.0000 0.0000`	

PTS STRINGS

TABLE 10-19. *Planned Line Waypoint*

Format		PTS x y
Where	**x**	waypoint easting in survey units
	y	waypoint northing in survey units
Sample Line		PTS 5569134.63 3774182.61

SVC STRINGS

TABLE 10-20. *Sound Velocity Correction*

Format		SVC bd ed sv
Where	**bd**	layer begin depth in survey units, referenced to water surface
	ed	layer end depth in survey units
	sv	layer sound velocity in meters/second
Sample Line		SVC 0.0 1.0 1481.66

Normally, there will be many of these records contained in the file header. One for each layer (velocity zone) measured by the sound velocity profiler.

SYN STRINGS

TABLE 10-21. *Time Synchronization Status*

Format	SYN dn t n rt vt vs se fa pa	
Where	dn	device number
	t	time tag in sec. after midnight
	n	number of values to follow

Format	SYN dn t n rt vt vs se fa pa	
	rt	reference time used for last synchronization in millisec past midnight
	vt	Veritime at last synchronization in millisec. past midnight
	vs	Veritime status
	se	Filtered Synchronizatin error in msec
	fa	Frequency Adjustment factor in msec. indicates how fast or slow the computer clock is compared to reference clock.[a]
	pa	Phase adjustment factor in microsec/ sec. indicates if computer clock is advanced or retarded compared to reference clock.[a]
Sample Line	`SYN 1 29253.002 6 29253003.000 29253002.958 34.000 0.000 -22.295 2.577`	

a. This value varies due to the normal instability of the computer clock and the measurement noise of the VERITIME process.

TND STRINGS

TABLE 10-22. *Survey Time and Date*

Format		TND t d
Where	**t**	time string
	d	date string
Sample Line		TND 15:54:33 08/28/95

USR

TABLE 10-23. *User Information*

Format	USR u r l k	
Where	u	User name
	r	Reseller
	l	License Type
	k	Key Number
Sample Line		

DATA STRINGS IN THE HYPACK® RAW FORMAT

FIX STRINGS

TABLE 10-24. *Fix (Event) Mark*

Format	FIX v t n x y	
Where	v	always 99
	t	time in sec. after midnight
	n:	FIX format version number. Always 2nd record in file
	x	X coordinate
	y	Y coordinate
Sample Line	`FIX 99 55990.660 5 455481.304 4942151.350`	

HCP STRINGS

TABLE 10-25. *Heave Compensation*

Format	HCP dn t h r p	
Where	dn:	device number
	t	time tag (seconds past midnight)
	h	heave in meters
	r	roll in degrees (+ port side up)
	p	pitch in degrees (+ bow up)
Sample Line	`HCP 2 57273.81 0 3.61 0`	

EC1 STRINGS

TABLE 10-26. *Echo Sounding (single frequency)*

Format	EC1 dn t rd	
Where	dn	device number
	t	time tag (seconds past midnight)
	rd	raw depth
	vn:	HSX format version number. Always 2nd record in file
Sample Line	`EC1 0 48077.365 3.20`	

EC2 STRINGS

TABLE 10-27. *Echo Sounding (dual frequency)*

Format	EC2 dn t rd1 rd2	
Where	dn	device number
	t	time tag (seconds past midnight)
	rd1	raw depth 1

Format	EC2 dn t rd1 rd2	
	rd2	raw depth 2
Sample Line	`EC2 0 48077.365 3.20 3.15`	

ECM STRINGS

TABLE 10-28. *Echo Soundings (multiple transducer system)*

Format	ECM dn t n rd1 rd2 rdn	
Where	dn	device number
	t	time tag (seconds past midnight)
	rd1	raw depth 1
	rd2	raw depth 2
	rdn	Raw depth, transducer n
Sample Line	`ECM 1 57274.82 9 11 10.8 10.7 11.4 11.8 13 15.1 15.5 15.6`	

GYR STRINGS

TABLE 10-29. *Gyro Data (Heading)*

Format	GYR dn t h	
Where	dn	device number
	t	time tag (seconds past midnight)
	h	ship heading angle
Sample Line	`GYR 0 57274.04 193`	

POS STRINGS

TABLE 10-30. *Position*

Format	POS dn t x y	
Where	dn	device number
	t	time tag (seconds past midnight)
	x	easting
	y	northing
Sample Line	`POS 0 57274.04 5569070.02 3774080.46`	

ROX STRINGS

TABLE 10-31. *Roxann data*

Format	ROX dn t n e1 e2	
Where	dn	device number
	t	time tag (seconds past midnight)
	n	number of values to follow (always 2)
	e1	roxann e1 measurement

Format	ROX dn t n e1 e2	
	e2	roxann e2 measurement
Sample Line	`ROX 2 48077.474 2 0.03 0.13`	

SB2 STRINGS

TABLE 10-32. *Multibeam data*

Format	SB2 dn t n sv r1 r2 r3 rn q1 q2 qn	
Where	dn	device number
	t	time tag (seconds past midnight)
	n	number of values to follow. Depends on device type
	sv	sound velocity from device
	r1-n	ranges in device units
	q1-n	quality codes (0 to 3 range, 0=bad). Packed 4 per number
Sample Lines		
Echoscan II	`SB2 1 48077.474 39 1500.00 19.50 19.31 …`	
Seabat 9001	`SB2 1 48077.474 76 1500.00 19.50 19.31 …`	
Seabat 9003	`SB2 1 48077.474 51 1500.00 19.50 19.31 …`	
Seabat 8101 using 101 beams	`SB2 1 48077.474 51 1500.00 19.50 19.31 …`	

RAW STRINGS

TABLE 10-33. *Position Information*

Format	RAW dn t n lat long alt utc	
Where	dn	device number
	t	time tag (seconds past midnight)
	n	number of values to follow
	lat	raw latitude X 100
	long	raw longitude X 100
	alt	antenna altitude above ellipsoid (meters)
	utc	GPS time
Sample Line	`RAW 0 33643.186 4 442442.89400 -831890.22200 177.86000 132459.00000`	

QUA STRINGS

TABLE 10-34. *Position Quality Information*

Format	QUA dn t n m h sat mode	
Where	dn	device number
	t	time tag (seconds past midnight)
	n	number of values to follow
	m	10 minus HDOP
	h	HDOP
	sat	number of satellites
	mode	GPS mode (NMEA 0183 standard values) 0 = fix not available or invalid 1 = GPS fix 2 = Differential GPS fix 3 = GPS PPS Mode fix 4 = RTK fix 5 = RTK Float
	The following 3 values are decoded from GST message:	
	sigman	standard deviation of latitude error (meters)
	sigmae	standard deviation of longitude error (meters)
	semimaj	Standard deviation of semi-major axis of error ellipsis (meters)
	Remaining values are present only if synchronizing computer clock with GPS clock:	
	ref	reference time at last sync (milliseconds since midnight)
	var	computer clock at last sync (milliseconds since midnight)
	syna	computer clock frequency adjustment factor (microseconds per sec)
	syne	filtered synchronization error (milliseconds)

Format	QUA dn t n m h sat mode	
	syns	synchronization status. Binary code with the following bits (other bits are not meaningful) 1 = not in sync 2 = low accuracy synchronization 4 = high accuracy synchronization 8 = synchronization failure
	synb	computer clock phase adjustment status
Sample Line	`QUA 0 33643.186 4 8.000 2.000 7.000 2.000`	

FXX Strings

TABLE 10-35. *Precision Shot Record*

Format	FXX dn t sn sx sy dl dbl hdg spd	
Where	dn	device number
	t	time tag (seconds past midnight)
	sn	shot_number
	sx	shot_x
	sy	shot_y
	dl	depth
	dbl	shot_dbl
	hdg	shot_hdg
	spd	shot_spd

CAP Strings

TABLE 10-36. *String Capture record*

Format	CAP dn t data	
Where	dn	device number
	t	time tag (seconds past midnight)
	data	ASCII string of data as it is read from device

RMB Strings

TABLE 10-37. *Raw Multibeam data*

Format	RMB t st sf bd n sv pn sonar range power gain GainMode	
Where	**dn**	device number
	t	time tag (seconds past midnight)

Format	RMB t st sf bd n sv pn sonar range power gain GainMode	
	st	Sonar type (See MBI)
	sf	Sonar flags (See MBI)
	Bd	Available beam data (See MBI)
	n	Number of beams to follow
	sv	Sound velocity in M/sec
	pn	Ping number (or 0 if not tracked)
	sonar	sonar ID (Optional.)
	range	sonar range setting if known. 0 if unknown (Optional)
	power	sonar power setting (Optional)
	gain	sonar gain setting (Optional)

Format	RMB t st sf bd n sv pn sonar range power gain GainMode	
	gain mode	additional gain information(Optional)
Sample Lines		**Seabat 9001 storing slant ranges, quality codes and sounding flags:** RMB 1 27244.135 1 0 E0 1500.00 0 60 19.50 19.31 18.60 1.66 18.47 … (60 slant ranges in survey units) 3 3 3 0 3 … (60 quality codes) 0 0 0 1 0 … (60 sounding flags) **Multiple transducer storing 8 raw depths:** RMB 1 27244.135 4 0 0 1500.00 0 60 31.44 33.01 32.83 32.80 … (8 raw depths in survey units) **Dual-head Seabeam SB1185 storing range, beam pitch and roll angles, ping delay times, beam quality code and sounding flags:** RMB 1 27244.135 2 5 D2 1500.00 0 108 93.18 88.30 84.74 80.46 … (108 slant ranges in working units) -69.72 -68.53 -67.36 -66.15 … (108 beam roll angles in degrees) 0 0 0 67 … (108 ping delay times in msecs) 7 7 7 7 … (108 beam quality codes) 0 0 0 0 … (108 sounding flags)

Immediately following the RMB record is a record containing slant ranges (multibeam) or raw depths (multiple transducer). Following the ranges are 0 to n additional records depending on the bd (beam data) field.

RSS

TABLE 10-38. *Raw Sidescan*

Format	RSS dn t sf np ns sv pn alt sr amin amax bs freq	
Where	**dn**	device number
	t	time tag (seconds past midnight

Format	RSS dn t sf np ns sv pn alt sr amin amax bs freq	
	sf	sonar flags (bit coded hexadecimal) 0100 – amplitude is bit-shifted into byte storage
	np	number of samples, port transducer (down-sampled to 2048 max
	ns	number of samples, starboard transducer (down-sampled to 2048 max
	sv	sound velocity in m/sec
	pn	ping number (or 0 if not tracked
	alt	altitude in survey units
	sr	sample rate (samples per second after down-sample)
	amin	amplitude minimum
	amax	amplitude maximum
	bs	Bit shift for byte recording
	freq	frequency (0 or 1 for simultaneous dual frequency operation)
Sample Line		RSS 3 61323.082 100 341 341 1460.00 0 10.75 4983.47 0 4096 4 109 97 84 95 120 111 … (341 port samples) 106 93 163 106 114 127 … (341 starboard samples)

Immediately following the RSS record are two records containing port and starboard amplitude samples.

DFT STRINGS

TABLE 10-39. *Draft Format*

Format	DFT 99 t d	
Where	99	"device number" always 99
	t	time tag in sec. after midnight
	d	draft correction
Sample Line	`DFT 99 78741.428 0.400`	

TID STRINGS

TABLE 10-40. *Tide Correction*

Format	dn t dc	
Where	dn	device number or 99
	t	time tag (seconds past midnight)

Format	dn t dc	
	dc	draft correction
Sample Line	TID 99 57273.814 -1.30	

HYPACK® ALL 2 FORMAT

The All2 format file has two parts:

- The **header** contains information about your project and hardware configuration.
- The **data records** follow the header. They are the result of merging the records the raw data based on the time-tags.

ALL 2 HEADER

The header section will be a duplication of the header from the RAW data file. Additional records may be added by various processing programs.

NOTE: The paths of files will not be written, provided the file is located in the expected default directory. This is being done to ease the transfer of projects between computers. For example, if someone copies a project from Drive C: on their computer to Drive D: on another computer, all of the associated files will not be found if the path has been included.]

TABLE 10-41. *All 2 Header Format*

Line	Description
FTP ALL 2	The first record located at the top of the header. It is used to identify the file as being an updated ALL format file.
VER "Survey 6.2.1.9"	Version information from the SURVEY program.
RDF "095_1303.RAW"	Name of raw data file of original data. The assumed default path is the Raw directory of the current project.
TFN "NB_Nov11_2004.TID"	Name of tide correction file used to edit data. The assumed default path is the current project directory.
SVF "C:\SVFiles\NV_Nov11_2004.VEL"	Name of sound velocity correction file used to generate sound velocity corrections. The assumed default path is the current project directory.
KEI "3k5*32L02"	Encrypted key number of dongle used to collect data. If we can also encrypt the company name from the dongle, it should be included.

Line	Description
KEO "9hU@uA3l"	Encrypted key number of dongle last used to process data. If we can also encrypt the company name from the dongle, it should be included
INF "Pat Sanders" "USNS Lollipop" "Job" "Headquarters" "Upper bay" -9.86 1.00 1500	Survey Information Line: The first four items are from SURVEY's Project Information window. • Project Name • Job Name • Area Name • Boat Name • Surveyor Name • Initial Tide Correction at Start-of-Line • Initial Draft Correction at Start-of-Line • Roxann Sound Velocity from Navigation Parameters window.
ELL "WGS-84" 6378137.000 298.257223563	This is the Ellipsoid information. The name of the ellipsoid is followed by the semi-major axis (a) in meters and the flattening (f). Note that the name of the ellipsoid is not enclosed in quotation marks in the RAW format
PRU "Feet" or PRU "Meters" or	Work units for project Fe = False Easting Fn = False Northing Hu = Conversion factor from Horizontal Unit to meters Vu = Conversion factor from Vertical Unit to meters Id = Projection ID. (See Table 10-42 on page 27) P1-P5 = Relevant Attributes. Unused parameters are always 0
DTM 9.90 -130.42 -199.07 2.11360 -1.33940 -4.39090 58.33700 "CONUS.LLS"	Datum Transformation Record. DTM <dx><dy><dz><drx><dry><drz><dscale> <lls_file>. The default location of the LLS file is the \HYPACK\DATUM directory. If 'lls_file' is not null dx, dy, dz, drx, dry, drz and dscale should be all 0. • dX • dY • dZ • rX (in seconds of arc) • rY (in seconds of arc) • rZ (in seconds of arc) • dScale (in ppm)

Line	Description
TND "10:56:40" "10/02/2003"	Time and Date Record Time of Start Line from Raw Datafile Date of Start Line from Raw Datafile
DTE "15:05:40" "11/	
DEV 0 4 "GPS Test" 49156 "c:\hypack\devices\gps.dll 3.2"	Device Record • Device ID • Number of values to follow • Device Name • Device ID Type • Device Driver (with version number)
OFF 0 -6.00 -20.00 0.00 0.00 0.00 0.00 0.00	Device Offset Record • Device ID • Starboard (+) Offset (Grid Units) • Forward(+) Offset (Grid Units) • Height Offset (Grid Units) • Yaw (Degrees: Positive clockwise) • Roll (Degrees:Positive portside upward) • Pitch (Degrees: Positive nose up) • Latency (Seconds) Time of transmission of measurement minus time of measurement.
PRI 0	Primary Navigation System. The label is followed by the device number of the primary navigation system.
LLS "C:\Hypack\Datum\conus.lls"	Datum Shift File. Blank if not present.
DVE "Elevation" 1000.00	Depth versus Elevation Record "Depth" or "Elevation" as defined in GEODETIC PARAMETERS Chart Datum Level from GEODETIC PARAMETERS
GEO 0.00 "G2003u05.geo"	Geoid Model File. Blank if not present. The default location of the 'geo' file is the \HYPACK\Datum directory. GEO <h_corr> <geo_file> Where 'h_corr' is orthometric height correction in meters.
PRD 0 "KTD C:\HYPACK\CHEAT.KTD"	'From KINEMATIC.DLL The default location of the KTD file is the current project directory.

Line	Description
PRD 1 OFF 3.00 -1.30 0.70 0.00 -10.00 0.00 PRD 1 OFF 3.00 0.00 0.70 0.00 0.00 0.00 PRD 1 OFF 0.00 0.00 0.65 0.00 0.00 0.00 PRD 1 OFF 0.00 -1.40 0.65 0.00 10.00 0.00	'From Knudsen Multiple Transducer Driver Proprietary Device Record. Each device driver is capable of writing a PRD record. The first entry after the label is the device number and then whatever the device wants to write.
PLF "E:\HYPACK\PROJECTS\CCSGA\SIDESCAN.LNW"	Planned line filename. This will replace the older 'FIL' record from the RAW data format. *FIL "RAW" "e:\hypack\projects\cssga\sidescan.lnw".* If there is no planned line being used, the program will write a blank text field after the PLF, **PLF ""** . The default directory for the LNW file is the current project directory.
LIN 2	Waypoints in Planned Line. This record will be immediately followed by the X-Y listing for each waypoint in the data file.
PTS 1007957.44 760823.55	A waypoint record. The X (Easting) and Y (Northing) follow the PTS label. There is one record for each waypoint.
LBP 1005616.80 759784.28	Line Beginning Point. This lists the first waypoint, based on the direction that the line was surveyed.
LNN 9	Line Name Record. The name or number of the planned line.
LTP 63.000000 21.000000	Line Template Point. Eleven LTP points follow the LNN record for lines that were created in CHANNEL DESIGN. This provides distance and depth information (distance from the line origin) that is used to reconstruct the channel template.
EOL	End of Line Information
REC 38	Number of fields in each record. This will be used to denote how many fields are contained in each data record. The last field (38^{th} in this example) will be a checksum for the record.
EOH ff	End of Header Record. After the EOH will be the two character checksum for the header information.

TABLE 10-42. *Projections: IDs and Properties*

Projection	ID/Properties
Lambert Conformal Conical	id = LCC p1 = central meridian p2 = reference latitude p3 = scale factor p4 = North parallel p5 = South parallel
Mercator	id = MER p1 = Central Meridian p2 = Reference Latitude
Transverse Mercator	id = TME p1 = Central Meridian p2 = Reference Latitude p3 = Scale Factor
Oblique Stereographic	id = OST p1 = Central Meridian p2 = Reference Latitude p3 = Scale Factor
Oblique Cylindrical (Swiss and EOV systems)	id = OCY p1 = Central Meridian p2 = Reference Latitude p3 = Scale Factor
Hotine Oblique Mercator	id = HOM p1 = Central Meridian p2 = Reference Latitude p3 = Scale Factor p4 = Azimuth of Skew
Rectified Skew Orthomorphic	id = RSO p1 = Central Meridian p2 = Reference Latitude p3 = Scale Factor p4 = Azimuth of Skew
Azimuthal Equidistant	id = AZD p1 = Central Meridian p2 = Reference Latitude
CMAP Mercator	id = CME, (no parameters)

Projection	ID/Properties
Albers Equal Area	id = ALA p1 = central meridian p2 = reference latitude p3 = North parallel p4 = South parallel
Cassini-Soldner	id = CAS p1 = Central Meridian p2 = Reference Latitude

ALL 2 DATA RECORDS

The data records proceed immediately after the CR-LF of the EOH record.

Each record will be comma delimited and contain the following fields. If no value exists for a field, it will be left unfilled (no zero).

TABLE 10-43. *All 2 Format Data Records - Field Definitions*

Field	Item
1	Last Event Number
2	X (Easting)
3	Y (Northing)
4	Time of Sounding (hh:mm:ss.sss)
5	High Frequency Depth (Depth 1)
6	High Frequency Flag: • 0 = Valid (Not modified) • 1 = Valid (Modified) • 2 = Deleted
7	High Frequency SV Correction
8	Low Frequency Depth (Depth 2)
9	Low Frequency Flag (same scheme as 5)
10	Low Frequency SV Correction
11	Tide Correction
12	Draft Correction
13	Heave Correction
14	Raw Heave (meters or feet)
15	Raw Roll (decimal degrees)
16	Raw Pitch (decimal degrees)

Field	Item
17	WGS84 Lat: SDDMM.MMMMMMMM
18	WGS84 Long: SDDDMM.MMMMMMMM
19	WGS84 Ellipsoid Height
20	GPS Status Code (e.g.: 2=Diff)
21	GPS HDOP/PDOP
22	GPS Number of Satellites
23	GPS Standard Error X
24	GPS Standard Error Y
25	GPS Standard Error Z
26	Vessel Heading
27	Vessel Course Made Good
28	Vessel XTE (=0 if no planned line)
29	Vessel DBL (=0 if no planned line)
30	Vessel Speed (knots)
31	Seabed E1
32	Seabed E2
33	Seabed ID
34	Seabed ID Color Code
35	Height of Ellipsoid Above Chart Datum
36	Height of Ellipsoid Above Geoid
37	Total Positioning Error
38	Record Checksum: The last two characters in each Data Record (followed by CHR$(13)+CHR$(10)). It will be recomputed anytime a Data Record is written by a HYPACK program.

TARGET FILE (*.TGT) FORMAT

A space delimited list of target properties as follows.:

String Values	Definition
GPT	Tag begins each string
Name	Target Name. Editable through the Target Editor or Survey's Target Properties. Defaults: • In the Target Editor, numbered in order of creation • In Survey, time created.
Easting	X Position Coordinate
Northing	Y Position Coordinate
Depth	Water depth at the target location
Lat	Latitude
Lon	Longitude
Time	Time target was created
Date	Date target was created
Distance	Targets marked during Survey with the target icon or F5 key are marked at the location of the tracking point. You can shift its position by specifying distance and bearing from its original position.
SBearing	
Code	Target type: 0 = Default value 1 = Water's Edge
Event	If the target is marked during SURVEY, this is the latest event number. Otherwise, this value will be 0.
Quality	Confidence Code for Target Classification. Otherwise, value is always '0'.
Notes	User notes entered in the Target Properties dialog, in SIDE SCAN TARGETING AND MOSAICKING during targeting, or in TARGET VIEWER
Extra	S57 symbol assigned to that target position.

String Values	Definition
Angle	The angle of the alarm flag from the target when displaying it in Survey/ DREDGEPACK®.
Sample Line	GPT "TGTName" 654901.61 283947.17 1.20 **32.48255317 -133.32768112** 17:31:29 1/29/2007 1.30 1.40 5 6 7.00 "notes" "SY(ACHARE02,0)" 90.00

Values are set in the TARGET EDITOR or in the Target Properties dialog in SURVEY.

More Information

- “Creating a New Target File” on page 2-262
- “Target Properties in Survey” on page 3-47

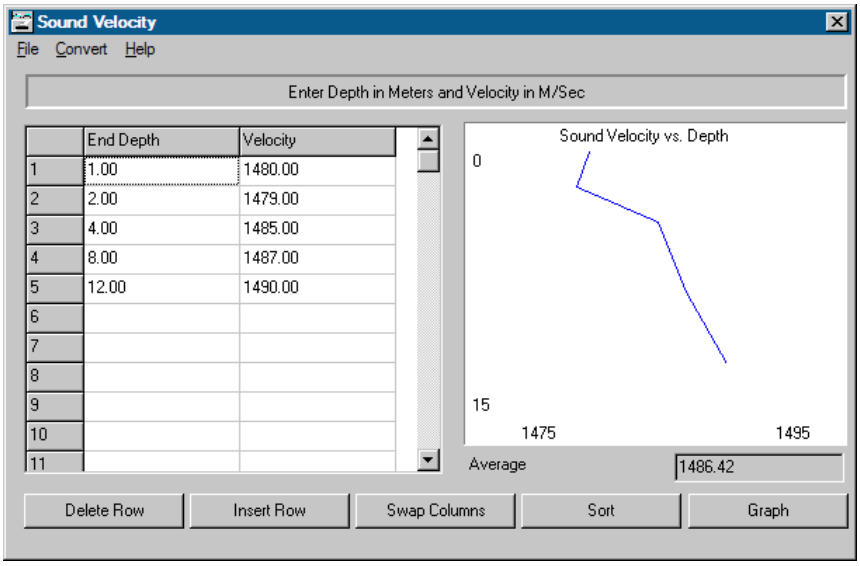
SOUND VELOCITY CORRECTIONS FILE (*.VEL)

The first line is “FTP NEW 2” followed by End Depth and Sound Velocity pairs.

Example:

```
FTP NEW 2
1.00 1480.00
2.00 1479.00
4.00 1485.00
8.00 1487.00
12.00 1490.00
```

FIGURE 10-1. *VEL file in the SOUND VELOCITY Program*



PLANNED LINE FILES (*.LNW)

The first line is always:After that, each line is described as follows:

Description	Definition
LNS n	Always the first line. n = number of lines in the file.
LIN n	n = number of waypoints in the line.
PTS X Y	One record for each waypoint where X and Y are the waypoint projection grid coordinates.
LNN *LineName*	*LineName* defaults to consecutive numbers, but may be edited in the LINE EDITOR.
EOL	End of Line

Example:

```
LNS 10
LIN 2
PTS 618379.72 668369.24
PTS 618307.74 668206.38
LNN 1
EOL
LIN 2
PTS 618338.57 668387.43
PTS 618266.58 668224.58
LNN 2
```

EOL...

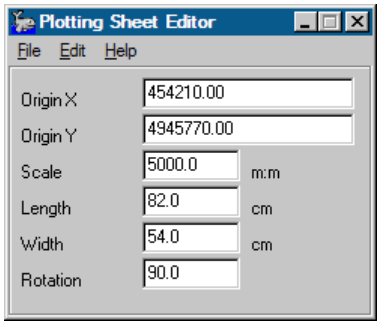
PLOTTING SHEET FILES (*.PLT)

An ASCII text file listing information entered in the PLOTTING SHEET EDITOR, one item per line as follows:

TABLE 10-44. *PLT Field Definitions*

Description	Sample File
• FileName • HPG/L • Length • Width • Origin X • Origin Y • Scale • Rotation • 1.00 • 20.00 • 2.00 • 90.00	HAL.PLT HPG/L 82.00 54.00 454210.00 4945770.00 5000.00 90.00 1.00 20.00 2.00 90.00

FIGURE 10-2. *Example displayed in the PLOTTING SHEET EDITOR*



MATRIX FILES (*MTX)

An ASCII file describes the matrix. Each file begins with a header which includes only the information you see in the MATRIX EDITOR.

TABLE 10-45. *MTX Format*

Description	Sample file
Corner X	454387.68
Corner Y	4945260.49
Length	3443.62
Width	285.21
Cell Length	10
Cell Width	10
Rotation	72
Matrix Type	1
Where	1=HYPACK® 2=HYSWEEP® 3=SeabedID

If the matrix is empty, it contains only header data.

If the matrix contains sounding data, the header will be followed by depth records as follows:

CellNumber DepthAsSurveyed DepthAsDredged

Look at the following examples.

TABLE 10-46. *Matrix Format Examples:*

Survey Data Only or Seabed ID Matrix	2422 65 2423 71.5 2079 62.8 2080 69.1 2424 71.5…
Dredge and Survey Data:	5021 14.55 14.20 5022 14.51 14.20 5023 14.76 14.55 5024 14.57 14.57 5025 14.52 14.52 5026 14.19 14.19
Hysweep Matrix	5107 102.03 102.43 204.46 2 43925700 5108 102.10 102.82 204.92 2 43925700 5109 102.33 102.89 205.22 2 43925700 5110 102.39 102.69 307.77 3 44451813

- The **Survey Data Only** matrix has two columns. The third column is created only if the matrix is opened for use in the DREDGEPACK® program. The **Seabed ID matrix** looks the same, but the second column stores the Seabed ID instead of depths.
- The **Dredge and Survey Data** matrix contains the third column with the dredge depths. The first three cells listed have had material

removed by the dredge so the depth values are different. The last three cells have not been dredged and their depth values are the same.

- The **Hysweep Matrix** records Cell Number, Minimum Depth, Maximum Depth, Sum of all depths, number of depths in the cell, time stamp (msec after midnight).

BORDER FILES (*.BRD)

Border files contain only a list of coordinate pairs for each waypoint in the border. HYPACK® uses all but the last point to create a polygon, then determines if the last point falls inside or outside the defined area.

Last Point Falls	Trimming Function saves
Inside the border area	Inside the border area
Outside the border area	Outside the border area
Example:	10.58 55.25 11.64 73.36 34.63 77.93 38.74 58.75 10.58 55.25 24.43 65.91

CHANNEL PLAN FILES (*.PLN)

Channel Plan files have two sections:

- From the top to the '[Geometry]' label, we list all of the data and settings that you have entered to the CHANNEL DESIGN tabs. The information for each tab has a label preceding it in square brackets (for example '[Center]').
- The [Geometry] section contains channel waypoints that have been calculated by CHANNEL DESIGN. Most of them will be the same as in the upper portion. However, if the ends of the toes and center line are not even, CHANNEL DESIGN adjusts the toes to be square with the center line and records the adjusted waypoints in this section.

When the PLN file is displayed in the HYPACK® window, the calculated points will be used to draw the channel, while the original points will be marked with small squares.

Channel Template Files (*.TPL)

A Channel Template file begins with the header that designates the format in which it is constructed. The most recent TPL format begins "FTP NEW".

Following the header, there are from 4 to 21 lines that define the channel.

Format	LTP dbl dep	
Where	LTP	Tag
	dbl	Distance from the beginning of the survey line.
	dep	Depth
Sample Line	LTP 251.87 58.00	

Beware! Take care that the calculation method you are using supports the number of template points you are creating. For example, the Standard Hypack method is the only method that supports 21 points.

Advanced Channel Files (*.CHN)

A Channel File has two sections.

- **Nodes:** The first section defines the nodes of your channel file. The section begins with a statement about the number of nodes (FACES 55), followed by the node data. One node is defined in each line, and each line contains the X, Y, Z and ID of the node.
- **Faces:** The second section begins with a statement of how many faces, then describes the faces of the channel through space delimited lists of node IDs, one line per face.

Sample File:

```
NODES 8
598150.00   105250.00   -50.00 A
598450.00  1105250.00  -50.00 B
598200.00  1105200.00  -60.00 C
598400.00  1105200.00  -60.00 D
598200.00  1105000.00  -60.00 E
598400.00  1105000.00  -60.00 F
598150.00  1104950.00  -50.00 G
598450.00  1104950.00  -50.00 H
FACES 5
A B D C A
B H F D B
H G E F H
```

G A C E G
C D F E C
SECTIONS 0

HSX Format – HYSWEEP® Text (ASCII) Logging

HYSWEEP® survey has a Text logging option (HSX format), allowing raw data to be stored in a format that can be inspected and modified by most editing program (Windows Wordpad for example). Easy inspection of files is the advantage of text logging - the disadvantage is larger files and slower load time. If file size and load time are important to you, it is best to choose the HYSWEEP® binary format (HS2).

HSX files are generally compatible with HYPACK® SURVEY raw format, allowing HYPACK® programs (HYPACK®, HYPLOT, etc.) to work with HSX files. The differences involve logging and processing of multibeam data, which is by the HYSWEEP® extensions to HYPACK®.

Each file contains two sections; a header, which is written when data logging starts, and a data section, which is written as data is collected. Most records starts with a three character tag.

HSX Header Strings

The header is a section of data at the beginning of each data file. It contains project information which is read in post-processing.

DEV Strings

FIGURE 10-1. *HYPACK® Device Information*

Format		DEV dn dc “name”
Where	**dn**	device number
	dc	Device capabilities (bit code) • 1, 2, 4, 8 – Position • 16 – depth • 32 – heading • 512 – MRU • 32768 – extended capabilities
	name	Device Name
Sample Line (GPS positions, speed and heading)		DEV 0 100 "GPS"

DV2 Strings

TABLE 10-1. *Hysweep Device Information*

Format		DV2 dn dc tf en
Where	**dn**	device number
	dc	HYSWEEP Device capabilities (bit code): • 0001 - Multibeam Sonar • 0002 - Multiple Transducer sonar • 0004 - GPS (Boat Position) • 0008 - Sidescan Sonar • 0010 - Single Beam Echosounder • 0020 - Gyro (boat heading) • 0040 - Tide • 0200 - MRU (heave, pitch and roll compensation)
	tf	1 if device is mounted on a tow fish
	en	1 if device is enabled
Sample Line		DV2 0 1 0 1

EOH Strings

The **End of Header** tag indicates end of the header in each file. It has no data itself. All subsequent lines are recorded data strings.

EOL Strings

The **End of Line** tag indicates end of planned line information. It has no data itself.

FTP Strings

The **File Type** (HYPACK® File Identifier) identifies HYPACK® 8.9 raw file. It is always 1st record in file.

Sample Line: FTP NEW 2

HSP Strings

TABLE 10-2. *Hysweep Survey Parameters*

Format	HSP p1 p2 p3 p4 p5 p6 p7 p8 p9 p10 p11 p12	
Where	**P1**	minimum depth (survey units)
	P2	maximum depth (survey units)
	P3	port side offset limit (survey units)
	P4	starboard side offset limit (survey units)
	P5	port side beam angle limit (degrees)
	P6	starboard side beam angle limit (degrees)
	P7	high beam quality; codes >= this are good
	P8	low beam quality: codes < this are bad
	P9	sonar range setting (survey units)
	P10	towfish layback (survey units)

Format	HSP p1 p2 p3 p4 p5 p6 p7 p8 p9 p10 p11 p12	
	P11	survey units: 0=meters, 1=us foot, 2=int'l foot
	P12	sonar id for advanced processing (See Table 10-3, "HysweeSonar ID Numbers," on page 40)
Sample Line		HSP 5.0 45.0 160.0 150.0 60 60 3 1 328.0 0.0 1

TABLE 10-3. *HysweeSonar ID Numbers*

Sonar	ID Number
*Not Specified	0
Reson Seabat 8101 - 150 Deg	1
Atlas Fansweep 20	2
Benthos C3D	3
CMAX CM-2	4
EdgeTech 272	5
EdgeTech 4100	6
EdgeTech 4125	7
EdgeTech 4150	8
EdgeTech 4200	9
EdgeTech 4300	10
GeoAcoustics GeoSwath	11
Imagenex Sportscan	12
Imagenex Yellowfin	13
Klein 595	14
Klein 2000	15
Klein 3000	16
Klein 3900	17
Klein 5000	18
Odom CV3	19
Odom Echoscan 2	20
Odom ES3	21
Reson Seabat 7125	22
Reson Seabat 8111	23
Reson Seabat 8124	24
Reson Seabat 8125	25

Sonar	ID Number
Reson Seabat 9001	26
Reson Seabat 9003	27
SEA Swathplus	28
Seabeam 2100	29
Seabeam SB1185	30
Simrad EA400	31
Simrad EM102	32
Simrad EM1002	33
Simrad EM2000	34
Simrad EM3000	35
Simrad EM3000D	36
Simrad EM3002	37
Simrad EM3002D	38
Reson Seabat 8101 - 210 Deg	39
Imagenex Delta T	40
Atlas Hydrosweep MD2	41
Simrad SM2000	42
Simrad EM710	43
Simrad EM302	44

HSX STRINGS

TABLE 10-4. *HSX File Identifier*

Format		HSX vn
Where	**vn**	HSX format version number.
		Always 2nd record in file. **HSX Format Versions:** • 29-Mar-2000:0 HYPACK® Max 0.4 • 11-Sep-2000: 1 HYPACK® Max 0.5 • 18-Jun-2001: 2 HYPACK® Max 0.5B • 05-Jun-2003: 3 HYPACK® Max 2.12A, Remove TFP (tow fish position) records
Sample Line		HSX 0

INF STRINGS

TABLE 10-5. *General Project Information*

Format	INF "surveyor" "boat" "project" "area" tc dc sv	
Where:	**tc:**	initial tide correction
	dc:	initial draft correction
	sv:	sound velocity
Sample Line	`INF "steve" "LCH 19" "mcmillen" "617.6 to 618.2" -0.7 0 1500.0`	

LBP STRINGS

TABLE 10-6. *Planned Line Begin Point.*

Format		LBP x y
Where	**x**	x grid position
	y	y grid position
Sample Line		LBP 5567222.42 3771640.72

LIN STRINGS

TABLE 10-7. *Planned Line Data follows*

Format		LIN nw
Where	**nw**	Number of waypoints
Sample Line		LIN 5

LNN STRINGS

TABLE 10-8. *Planned Line Name*

Format		LNN text
Where	**text**	line name or number
Sample Line		LNN 14

MBI STRINGS

TABLE 10-9. *Multibeam / Multiple Transducer Device information*

Format		MBI dn st sf bd n1 n2 fa al
Where	**dn**	device number
	st	sonar type code • 0 – invalid • 1 – fixed beam roll angles (e.g., Reson Seabat) • 2 – variable beam roll angles (e.g., Seabeam SB1185) • 3 – beam info in spherical coordinates (e.g., Simrad EM3000) • 4 – multiple transducer (e.g., Odom Miniscan)

Format		MBI dn st sf bd n1 n2 fa al
	sf	sonar flags (bit coded hexadecimal) • 0001– roll corrected by sonar • 0002– pitch corrected by sonar • 0004– dual head • 0008–heading corrected by sonar (ver 1) • 0010 – medium depth: slant ranges recorded to 1 dm res. (version 2) • 0020 – deep water: slant ranges divided by 1 m resolution (ver 2) • 0040 - SVP corrected by sonar (ver 5) • 0080 - topographic device; upgoing beams accepted. (ver 6)
	bd	beam data (bit coded hexadecimal) • 0001 – beam ranges are available (survey units) • 0002 – sounding point easting available (survey units) • 0004 – point northing available (survey units) • 0008 – point corrected depth available (survey units) • 0010 – along track distance available (survey units) • 0020 – across track distance available (survey units) • 0040 – beam pitch angles available (degrees, TSS convention) • 0080 – beam roll angles available (degrees, TSS convention) • 0100 – beam takeoff angles available (degrees from vertical) • 0200 – beam direction angles available (degrees from forward) • 0400 – ping delay times included (milliseconds) • 0800 – beam intensity data available • 1000 – beam quality codes (from sonar unit) available • 2000 – sounding flags included • 4000 - spare • 8000 - spare

Format		MBI dn st sf bd n1 n2 fa al
	n1	number of beams, head 1 (multibeam) or number of transducers (multitransducer)
	n2	number of beams, head 2 (multibeam)
	fa	first beam angle is for sonar type = fixed angle (degrees, TSS convention)
	ai	angle increment is for sonar type = fixed angle (degrees, TSS convention)
Sample Line		MBI 1 1 0 1801 60 0 44.250 -1.500

0F2 STRINGS

TABLE 10-10. *Device Offsets*

Format		OF2 dn on n1 n2 n3 n4 n5 n6 n7
Where	**dn**	device number
	on	offset number • 0 – position antenna offsets • 1 – gyro heading offset • 2 – MRU device offsets • 3 – Sonar head 1 / Transducer 1 offsets • 4 – Sonar head 2 / Transducer 2 offsets • 131 – Transducer 128 offsets
	n1	Starboard / port mounting offset. Positive starboard
	n2	Forward / aft mounting offset. Positive forward
	n3	Vertical mounting offset. Positive downward from waterline
	n4	Yaw rotation angle. Positive for clockwise rotation
	n5	Roll rotation angle. Port side up is positive
	n6	Pitch rotation angle. Bow up is positive
	n7	Device latency in seconds
Sample Line		OF2 0 3 6.2 –1.3 6.1 2.15 -0.27 1.00 0.000

PRI STRINGS

TABLE 10-11. *Primary Navigation Device*

Format		PRI dn
Where	**dn**	device number
Sample Line		PRI 0

PTS STRINGS

TABLE 10-12. *Planned Line Waypoint*

Format		PTS x y
Where	**x**	waypoint easting in survey units
	y	waypoint northing in survey units
Sample Line		PTS 5569134.63 3774182.61

SSI STRINGS

TABLE 10-13. *Sidescan Device Information*

Format		SSI dn sf np ns
Where	**dn**	device number
	sf	sonar flags (bit coded hexadecimal) 0100 – amplitude is bit-shifted into byte storage
	np	number of samples per ping, port transducer
	ns	number of samples per ping, starboard transducer
Sample Line		SSI 1 256 1024 1024

SVC STRINGS

TABLE 10-14. *Sound Velocity Correction*

Format		SVC bd ed sv
Where	**bd**	layer begin depth in survey units, referenced to water surface
	ed	layer end depth in survey units
	sv	layer sound velocity in meters/second
Sample Line		SVC 0.0 1.0 1481.66

Normally, there will be many of these records contained in the file header. One for each layer (velocity zone) measured by the sound velocity profiler.

TND STRINGS

TABLE 10-15. *Survey Time and Date*

Format		TND t d
Where	**t**	time string

Format		TND t d
	d	date string
Sample Line		TND 15:54:33 08/28/95

HSX Data Strings

DFT Strings

TABLE 10-16. Dynamic Draft (Squat) Correction

Format		DFT dn t dc
Where	dn	device number or 99
	t	time tag (seconds past midnight)
	dc	draft correction
Sample Line		DFT 99 57273.81 –0.30

FIX Strings

TABLE 10-17. Fix (Event) Mark

Format		FIX dn t n
Where	dn	device number or 99
	t	time tag (seconds past midnight)
	n	event number
Sample Line		FIX 99 57273.81 15

HCP Strings

TABLE 10-18. Heave Compensation

Format		HCP dn t h r p
Where	dn	device number
	t	time tag (seconds past midnight)
	h	heave in meters
	r	roll in degrees (+ port side up)
	p	pitch in degrees (+ bow up)
Sample Line		HCP 2 57273.81 0 3.61 0

GPS Strings

TABLE 10-19. GPS measurements

Format		GPS dn t cog sog hdop mode nsats
Where	dn	device number
	t	time tag (seconds past midnight)
	COG	Course Over Ground (degrees)

Format		GPS dn t cog sog hdop mode nsats
	SOG	Speed Over Ground (knots)
	HDOP	GPS HDOP
	Mode	GPS mode • 0 : unknown • 1: stand alone • 2: differential • 3: RTK
	NSats	Number of Satellites
Sample Line		GPS 0 57274.044 124.4 5.66 2.1 2 4

GYR STRINGS

TABLE 10-20. *Gyro Data (Heading)*

Format		GYR dn t h
Where	**dn**	device number
	t	time tag (seconds past midnight)
	h	ship heading angle
Sample Line		GYR 0 57274.04 193.71

POS STRINGS

TABLE 10-21. *Position*

Format		POS dn t x y
Where	**dn**	device number
	t	time tag (seconds past midnight
	x	easting
	y	northing
Sample Line		POS 0 57274.042 5569070.02 3774080.46

PSA STRINGS

TABLE 10-22. *Pitch Stabilization Angle*

Format		PSA dn t pn a0 a1
Where	**dn**	device number
	t	time tag (seconds past midnight
	pn	ping number
	a0	projector (head 0) pitch angle
	a1	projector (head 1) pitch angle
Sample Line		

NOTE: PSA records are recorded only when pitch stabilization is active. They immediately precede corresponding RMB records.

RMB STRINGS

TABLE 10-23. *Raw Multibeam data*

Format	RMB t st sf bd n sv pn sonar range power gain GainMode	
Where	**dn**	device number
	t	time tag (seconds past midnight)
	st	Sonar type (See MBI)
	sf	Sonar flags (See MBI)
	Bd	Available beam data (See MBI)
	n	Number of beams to follow
	sv	Sound velocity in M/sec
	pn	Ping number (or 0 if not tracked)
	sonar	sonar ID (Optional. See Table 10-3, “HysweeSonar ID Numbers,” on page 40)
	range	sonar range setting if known. 0 if unknown (Optional)
	power	sonar power setting (Optional)
	gain	sonar gain setting (Optional)

Format	RMB t st sf bd n sv pn sonar range power gain GainMode	
	gain mode	additional gain information(Optional)
Sample Lines		**Seabat 9001 storing slant ranges, quality codes and sounding flags:** RMB 1 27244.135 1 0 E0 1500.00 0 60 19.50 19.31 18.60 1.66 18.47 … (60 slant ranges in survey units) 3 3 3 0 3 … (60 quality codes) 0 0 0 1 0 … (60 sounding flags) **Multiple transducer storing 8 raw depths:** RMB 1 27244.135 4 0 0 1500.00 0 60 31.44 33.01 32.83 32.80 … (8 raw depths in survey units) **Dual-head Seabeam SB1185 storing range, beam pitch and roll angles, ping delay times, beam quality code and sounding flags:** RMB 1 27244.135 2 5 D2 1500.00 0 108 93.18 88.30 84.74 80.46 … (108 slant ranges in working units) -69.72 -68.53 -67.36 -66.15 … (108 beam roll angles in degrees) 0 0 0 67 … (108 ping delay times in msecs) 7 7 7 7 … (108 beam quality codes) 0 0 0 0 … (108 sounding flags)

Immediately following the RMB record is a record containing slant ranges (multibeam) or raw depths (multiple transducer). Following the ranges are 0 to n additional records depending on the bd (beam data) field.

RSS STRINGS

TABLE 10-24. *Raw Sidescan*

Format	RSS dn t sf np ns sv pn alt sr amin amax bs freq	
Where	**dn**	device number
	t	time tag (seconds past midnight

Format	RSS dn t sf np ns sv pn alt sr amin amax bs freq	
	sf	sonar flags (bit coded hexadecimal) 0100 – amplitude is bit-shifted into byte storage
	np	number of samples, port transducer (down-sampled to 2048 max
	ns	number of samples, starboard transducer (down-sampled to 2048 max
	sv	sound velocity in m/sec
	pn	ping number (or 0 if not tracked
	alt	altitude in survey units
	sr	sample rate (samples per second after down-sample)
	amin	amplitude minimum
	amax	amplitude maximum
	bs	Bit shift for byte recording
	freq	frequency (0 or 1 for simultaneous dual frequency operation)
Sample Line		RSS 3 61323.082 100 341 341 1460.00 0 10.75 4983.47 0 4096 4 109 97 84 95 120 111 … (341 port samples) 106 93 163 106 114 127 … (341 starboard samples)

Immediately following the RSS record are two records containing port and starboard amplitude samples.

SNR STRINGS

TABLE 10-25. *Sonar Runtime Settings*

Format		TID dn t tc
Where	**dn**	device number or 99
	t	time tag (seconds past midnight
	pn	ping number (0 if not tracked)
	sonar	sonar ID (See Table 10-3, “HysweeSonar ID Numbers,” on page 40)
	ns	Number of setting to follow
	s	up to 12 settings
Sample Line		SNR 1 65751.781 218 9 5 100 107 11400 12600 8

Five optional fields are included at the end of RMB records giving sonar range, power and gain settings. These settings are defined differently depending on sonar model and manufacturer.

TABLE 10-26. *For Seabat 81XX Serial and 81XX Network Drivers:*

Sonar ID	1, 23, 24, 25, 39
P0	Sonar range setting in meters.
P1	power setting, 0 - 8
P2	gain setting, 1 – 45
P3	gain modes: bit 0 = TVG on/off, bit 1 = auto gain on/off.

TABLE 10-27. *For Seabat 7XXX Drivers (7125, 7101, 7150, 7111):*

Sonar ID	22, 53, 60, 62
P0	Sonar range selection in meters.
P1	Transmit power selection in dBs relative to 1 uPa
P2	Receiver gain selection in 0.1 dBs
P3	Transmitter frequency in KHz.
P4	Transmit pulse width in microseconds.

TABLE 10-28. *For EdgeTech 4200 Driver*

Sonar ID	7-10
P0	Pulse power setting, 0 to 100 percent.
P1	ADC Gain factor.
P2	Start Frequency in 10 * Hz.
P3	End Frequency in 10 * Hz.
P4	Sweep length in milliseconds.

TID STRINGS

TABLE 10-29. *Tide Correction*

Format	**dn t dc**	
Where	dn	device number or 99
	t	time tag (seconds past midnight)
	dc	draft correction
Sample Line	`TID 99 57273.814 -1.30`	

KEYBOARD SHORTCUTS

3D SHAPE EDITOR KEYBOARD COMMANDS

In the 3D Shape Editor, keyboard commands affect *either* the 2D design panes or the 3D Perspective view. Select which view(s) you want to affect by first clicking in the corresponding window.

TABLE 10-1. *Zoom Functions.*

Function	Command
Zoom in	Shift+Up Arrow
Zoom in fast	Shift + Ctrl + Up Arrow
Zoom out	Shift + Down Arrow
Zoom out fast	Shift + Ctrl + Down Arrow

TABLE 10-2. *Perspective View*

Perspective view	
Pitch forward	Down Arrow
Pitch back	Up Arrow
Roll port	Ctrl + Down Arrow
Roll starboard	Ctrl + Up Arrow
Rotate clockwise 1 unit	Right Arrow
Rotate clockwise 10 units	Ctrl + Right Arrow
Rotate counter clockwise 1 unit	Left Arrow
Rotate counter clockwise 10 units	Ctrl + Left Arrow

TABLE 10-3. *2D Design Panes*

Function		Command
NOTE: These keyboard commands describe the motion of the viewing camera. The object appears to move in the reverse direction.		
Left 1 unit	(Top and Back view move right)	Left Arrow
Left 10 units	(Top and Back view move right)	Ctrl + Left Arrow
Right 1 unit	(Top and Back view move left)	Right Arrow
Right 10 units	(Top and Back view move left)	Ctrl + Right Arrow
Down 1 unit	(Right and back view move up)	Down Arrow
Down 10 units	(Right and back view move up)	Ctrl + Down Arrow

Function		Command
Up 1 unit	(Right and back view move down)	Up Arrow
Up 10 units	(Right and back view move down)	Ctrl + Up Arrow

3D Terrain Viewer Keyboard Commands

TABLE 10-4. *Speed*

Speed	
Increase Camera Speed 1 unit/sec	NumPad +
Decrease Camera Speed 1 unit/sec	NumPad -
Set Camera Speed to 0	S
Stop all camera motion	NumPad 0

TABLE 10-5. *Turning*

Turning	
Turn change +1 deg/sec	Right Arrow
Turn change by +10 deg/sec	Ctrl + Right Arrow
Turn change -1 deg/sec	Left Arrow
Turn change by -10 deg/sec	Ctrl + Left Arrow
Set Camera Turn change to 0	R

TABLE 10-6. *Tilt*

Tilt	
Tilt +1 degree	NumPad 8
Tilt +10 degrees	Ctrl + NumPad 8
Tilt -1 degree	NumPad 2
Tilt -10 degrees	Ctrl + NumPad 2
Set Camera Tilt to 0	T
Set Camera Yaw and Tilt to 0	NumPad 5

TABLE 10-7. *Elevation*

Elevation	
Elevation change by +1 unit/sec	Up Arrow
Elevation change by +10 units/sec	Ctrl + Up Arrow
Elevation change by -1 unit/sec	Down Arrow

Elevation	
Elevation change by -10 units/sec	Ctrl + Down Arrow
Set Elevation change to 0	Z
Elevation	

TABLE 10-8. *Yaw*

Yaw	
Yaw +1 degree	NumPad 6
Yaw +10 degrees	Ctrl + NumPad 6
Yaw -1 degree	NumPad 4
Yaw -10 degrees	Ctrl + NumPad 4
Set Camera Yaw to 0	Y
Set Camera Yaw and Tilt to 0	NumPad 5

TABLE 10-9. *Zoom*

Zoom	
Zoom In	NumPad /
Zoom Out	NumPad

TABLE 10-10. *Radar Mode*

Function	Command
Set sweep speed	Yaw Controls

TABLE 10-11. *Camera Motion Commands*

Function	Command
Pauses / Resumes camera motion	Space bar
Stops all Camera motion	NumPad 0

In the Full Screen Display, the camera controls are no longer accessible. All keyboard commands still apply and a few mouse controls have been added.

TABLE 10-12. *Full Screen Display Controls*

Added Full Screen Display	
Yaw and Tilt	Left Mouse drag

Added Full Screen Display	
Horizontal Translation	Right Mouse drag
Vertical Translation	Rt. Mouse + Ctrl

SURVEY KEYBOARD COMMANDS

The following tables provide all of the keyboard shortcuts for many actions you may use during Survey. All of these are available in the menu system, but the keyboard commands are quicker and easier.

For quick reference, the following list of keyboard commands can be accessed by selecting HELP-SHORTCUTS.

TABLE 10-13. *Line Functions*

Functions	Commands
Decrement line by 1 (Works only when not logging.)	Ctrl+D
Increment line by 1 (Works only when not logging.)	Ctrl+I
Swap planned start end	Ctrl+W
Decrement line segment by 1	Ctrl+B
Increment line segment by 1	Ctrl+F

TABLE 10-14. *Logging Functions*

Functions	Commands
Start Logging	Ctrl+S
Pause Logging	Ctrl + U
Resume Logging	Ctrl + R
Manual Event Mark	Ctrl+N
End Logging	Ctrl+E

TABLE 10-15. *Anchor Commands*

Functions	Commands
Drop Anchor	Alt+Anchor#
Raise Anchor	Alt+Anchor#

TABLE 10-16. *Tide Correction Commands*

Functions	Commands
Increment by current increment	Alt+Y
Decrement by current increment	Alt+Z

TABLE 10-17. *Map Window Commands*

Functions	Commands
Zoom In	+
Zoom Out	-
Move right, left, up and down	Arrow Keys
Rotate Starboard	Ctrl++
Rotate Port	Ctrl+-
North Up	Ctrl+Home

TABLE 10-18. *Left-Right Indicator Commands*

Functions	Commands
Contract scale	Ctrl+C
Expand scale	Ctrl+V

TABLE 10-19. *Profile Window Commands*

Functions	Commands
Contract horizontal scale	Ctrl+C
Expand horizontal scale	Ctrl+V
Decrease Vertical scale	Alt+C
Increase vertical scale	Alt+V

TABLE 10-20. *Target Commands*

Functions	Commands
Mark target at tracking point	F5
Target Properties dialog	F6
Marks a Waters Edge Target	F7

CLOUD KEYBOARD SHORTCUTS

TABLE 10-21. *Map Window Commands*

Functions	Mouse Control	Keyboard Commands
Zoom In	Wheel Up	+
Zoom Out	Wheel Down	-
Center Display on Screen, Maintain Rotation	Click 'Center' icon then on the point to center.	
Center Display, Rotations=0, Z-Axis ratio=1		Home
Shift Display	Right-click and drag	Shift+Arrows

TABLE 10-22. *Model Manipulstion*

Functions	Mouse Control	Keyboard Commands
Increase pixel size		<
Decrease pixel size		>
Increase Z-scale		Page up
Decrease Z-scale		Page down
Rotate Z-Axis 1 degree	Shift + Wheel up/down	Click and drag left/right

LICENSE TYPES AND THEIR PROGRAMS

FIGURE 10-1. *Hardlocks and Programs*

	HYPACK Standard	HYPACK Lite	HYPACK Survey	HYPACK Office	HYSWEEP (4)	HYSWEEP Office (5)	HYPACK + HYSWEEP	HYPACK Survey + HYSWEEP	HYPACK Office + HYSWEEP Office	DREDGEPACK	Navigation
HYPACK Shell	•	•	•	•			•	•	•	•	•
Geodetic Parameters	•	•	•	•			•	•	•	•	•
Geodetic Utilities	•	•	•	•			•	•	•	•	
Channel Design/Adv. Channel Des.	•	•	•	•			•	•	•	•	
Single Beam Latency Calibration	•	•	•				•	•			
Design and Support File Editors	•	•	•	•			•	•	•	•	•
HYPACK Survey	•	•	•				•	•		(3)	(6)
Tides and Sound Velocity	•	•	•	•			•	•	•	•	
Single Beam Editing	•	•		•			•		•		
Sounding Selection Programs	•	•		•			•		•		
Export to CAD	•	•		•			•		•		
Plotting Smooth Sheets	•			•			•		•		
Cross Sections & Volumes	•			•			•		•		
Surface Modeling/Contouring	•			•			•		•	•	
Digitized Charts & Echograms	•			•			•		•	•	
Metadata	•			•			•		•		
Real Time Terrain Visualization	•	•	•	•			•	•	•	•	
ADCP Logging	•		(1)	(2)			•	(1)	(2)		
Utility Programs	•	•		•			•		•	•	
Multibeam Data Collection					•		•	•			
Multibeam Data Processing					•	•	•	•	•		
Multibeam Patch Test					•	•	•	•	•		
Multibeam Performance Test					•	•	•	•	•		

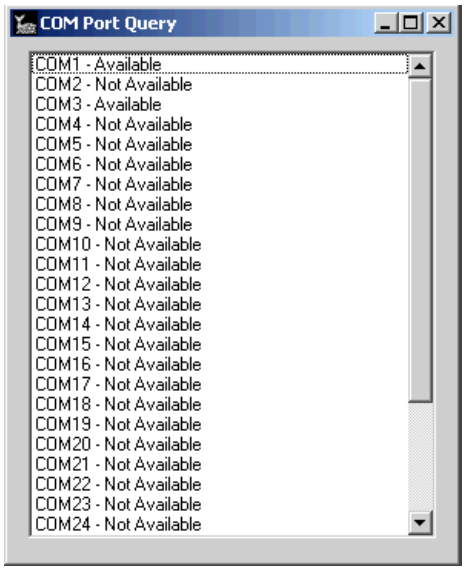
1. Survey versions include only the data collection modules from the ADCP programs.
2. Office versions include only the data processing modules from the ADCP programs.
3. The DREDGEPACK® version runs DREDGEPACK® in place of the HYPACK® Survey program.
4. These packages require that you have an existing HYPACK® (Standard, Lite or Survey) package already installed on the same computer.
5. HYPACK, Inc. reserves the right to alter the modules contained in each package.
6. Targeting enabled. Shared Memory and Logging capabilities disabled.

SERIAL INTERFACING

For serial communication to succeed, the communication parameters must be configured in HARDWARE for each device. They must be set to match your equipment or you don't have any chance to read the device in the SURVEY program.

The other component to serial communication is the hardware itself. Your computer needs enough serial ports to accommodate all of your sensors without port conflicts. To check port availability, select UTILITIES-COMMUNICATION-COMQUERY. A dialog will display a list of ports and whether they are available.

FIGURE 10-1. *ComQuery Dialog*



Some devices are made so you can feed the data from one, through the other to the computer on one serial port. For example, GPS units commonly send their data through echosounders and gyros. This is called multiplexing. In this case, each of the device drivers would be set to the same COM port.

COMMUNICATION PARAMETERS

Serial interfacing can be compared to running a single pipeline. Survey information is broken into individual characters, which are then broken down into a series of ones and zeroes. These ones and zeroes are known as bits. Each one or zero is transmitted by changing the voltage on a transmit wire. Your survey equipment may change the voltage to 5V to designate a zero, and then drop the voltage to 0V to designate a one.

Data bits and Stop bits*:* This series of bits is normally transmitted in series of seven or eight data bits. Each hardware device will have a setting called data bits, which defines the number of bits in each group. At the end of each group, the device inserts one or more Stop bits. This provides the equipment with a little time to process each message and prepare for the next message.

Parity*:* When serial transmission was first implemented, it was not as perfected as it is today. In order to check whether or not a message was correctly received, transmitting equipment would add a Parity bit. This was a single bit which would be either a zero or a one, depending on the sum of the data bits in the message group.

- **If you selected Even Parity**, the parity bit would be set so the sum of all of the data bits and parity bit would be an even number.
- **If you selected Odd Parity**, the parity bit would be set so the sum of all of the data bits and parity bit would be an odd number. This gave the receiving equipment a 50/50 chance of detecting a bad data group.

As serial equipment became more reliable, manufacturers began to eliminate the parity bit. In this case, a setting of None or No Parity would tell the devices not to worry about a parity bit.

Baud Rate*:* The final essential piece of information needed to establish communication between two devices is the Baud Rate. This is the speed, expressed in bits per second, with which the two devices send characters to each other. In order to successfully communicate, both devices need to agree as to the Baud Rate, the Data bits, Stop bits and Parity. If any of these values are not specified correctly, the results may vary. For example, if you incorrectly specify the baud rate, your computer will receive what it thinks is gibberish. If you incorrectly specify the number of Stop bits, it may be able to successfully decipher 80% of the received messages.

Handshaking*:* The other key, essential in serial communications is called Handshaking. This is how one device tells another device that it is either ready or not ready to receive additional information. For example, most computers can send information to a plotter faster than the plotter is capable of processing it. The plotter, first, stores information in a temporary buffer until it can process it. Once the buffer becomes full, it needs some way of telling the computer to stop sending the information. This is done via Handshaking. Handshaking is normally accomplished by one of the following methods:

Xon/Xoff is preferred by some devices because it requires no additional wires, other than a transmit, receive and signal ground wires. When a device is becoming full, it sends an Xoff character (CHR$17). Upon receipt, the transmitting device stops sending information. Once the receiving device has processed enough information and can receive more information, it sends an Xon character (CHR$19). This allows the transmitting device to resume its transmission. For equipment requiring

this type of handshaking, set the Flow Control to software in the COM properties dialog.

CTS/RTS (Clear to Send/Ready to Send) and DST/DTR (Data Set Ready/Data Terminal Ready) are similar methods. They each require up to two additional wires in the serial cable. The transmitting device uses one wire to tell the receiving device it is ready to send data. The receiving device uses the other wire to tell the transmitting device it is ready to receive data. If one, or both, of the conditions are not met, the device does not transmit. HYPACK® supports CTS/RTS handshaking when the Flow Control in the COM properties dialog is set to "hardware". Devices that require DST/DTR handshaking are a little different. The Flow Control is still set to "hardware", but you will also need a custom cable. The cable must connect the HYPACK® RTS pin to the device DSR pin, and the HYPACK® CTS pin to the device DTR pin for the devices to communicate.

In HYPACK®, we prefer that all handshaking be set to None. This means that as soon as a measurement is made, it is transmitted to the computer without any additional delay. Unless there are overriding reasons, all equipment, with the exception of plotters, should be set with no handshaking.

SERIAL HARDWARE

Now that your communication parameters are set correctly, let's look at serial hardware.

All serial ports in your computer are referenced by a location (I/O Address). Serial ports are referred to as COM ports. The first one will be called COM1:, the second one COM2:, etc. Serial ports are being phased out as standard equipment on PCs, however, they can be added by using PCMCIA or PCI serial cards. These cards come with one, two or four serial ports on a single card.

We recommend PCI type boards like the ones from Comtrol or Digi for desktop PCs and PCMCIA to serial cards like those from Quatech or Socket for notebooks.

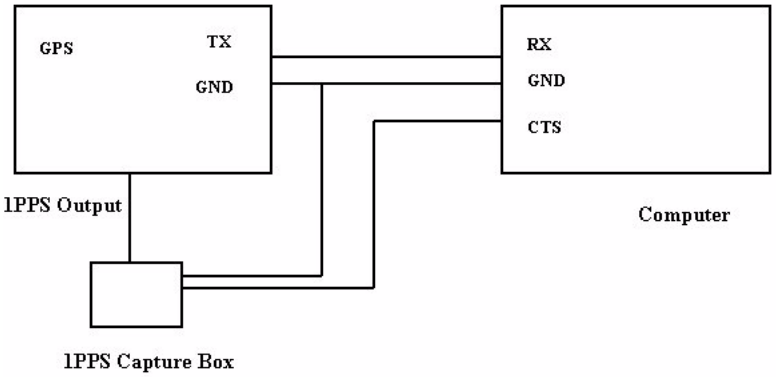
BEWARE! USB technology is designed to give priority to Windows® functions. This can result in extreme and inconsistent latency issues. *You cannot rely on USB to Serial connectors for time-critical data!*

HOW THE 1PPS BOX WORKS

The "Use PPS box for timing" option instructs the SURVEY program that you have the special hardware needed to perform this method of time tagging. The problem with T_0 pulses is that their duration is normally too short to successfully be captured by normal PC hardware (2-5 nanoseconds).

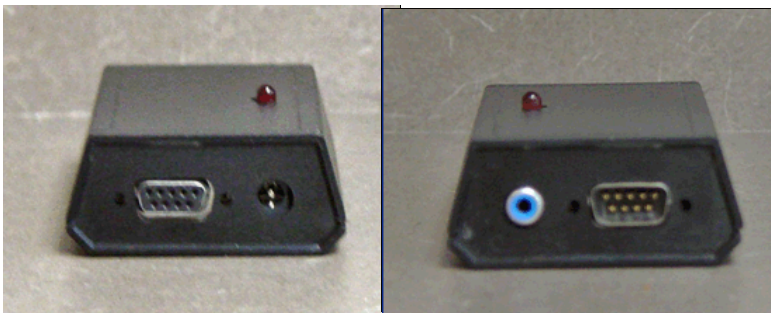
In order to capture the pulse, HYPACK, Inc. builds a special hardware box. This box contains a simple transistor. Every time a pulse is received from the GPS, the transistor changes a voltage level from 0 VDC to 5 VDC or from 5 VDC to 0 VDC. This voltage is wired into the CTS (Clear to Send) port of the serial port that captures the GPS messages.

FIGURE 10-1. *Cabling Diagram for 1PPS Connections*



The transmit line from the +GPS (TX) is connected to the receive line (RX) on the computer's serial port. The signal ground (GRD) is connected between the GPS and the computer. These are the normal cable connections between a GPS and a computer. The 1PPS output is connected to the 1PPS Capture box. The signal ground from the 1PPS box is connected to the common signal ground. The output signal from the capture box is connected to the Clear to Send (CTS) line on the same computer serial port.

FIGURE 10-2. *PPS Box-Front View (left) RS232 Out to PC, 12V DC In; Rear View (right) 1PPS Strobe, 1PPS In from GPS, RS232 In from GPS*



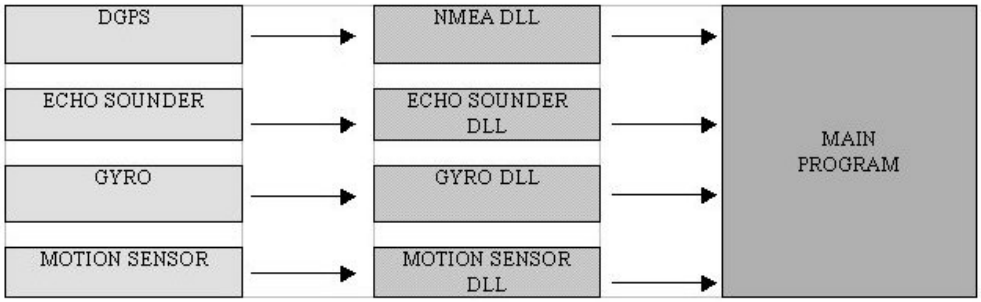
DRIVERS AND THEIR DEVICES

DEVICE DRIVERS

HYPACK® can communicate with about 180 different types of survey equipment. This includes positioning systems, echosounders, motion sensors, gyros, tide gauges, magnetometers, and other pieces of survey equipment. If all of this code were built into the SURVEY program, it would be huge, requiring faster, more powerful computers to operate it.

HYPACK® solves this problem by using “Dynamic Link Libraries” or "DLL’s”. A DLL is a piece of code, which is loaded when you execute a program. A device driver controls each piece of survey equipment in HYPACK®. The code for each driver has been written as a DLL. When the SURVEY program starts, it looks to see what type of equipment you have specified. Based on the device drivers you have selected, it loads the DLL code for only those drivers. This enables us to build powerful device handlers for each type of equipment, while keeping the size and computer requirements needed to run the SURVEY program to a minimum.

FIGURE 10-1. *How HYPACK’S SURVEY Program uses device drivers (DLL’s)*



For each device, we have specified a device driver that knows how to talk to the device, how to decode its information and how often it passes the information to the main body of the SURVEY program. A DLL is responsible for all communications with its piece of survey equipment. For a DGPS system, it needs to be able to read the different messages the DGPS sends, time tag them and then forward them to the main SURVEY program when requested. The DLL also sends messages from the Main program back to the survey device. An example of this would be the passing of annotation information to an echosounder.

DEVICES SUPPORTED BY HYPACK® HARDWARE

The following is a list of the devices currently supported by HYPACK® and the associated device driver name.

NOTE: This list does not include drivers that have been custom-made for individual users.

TABLE 10-1. *HYPACK® Drivers and Devices.*

Device Name	Driver Name
A2T-S USDigital	A2TSatt.dll
ADCP	ADCP.dll
AIS	AIS.dll
Allied Signal LAZ-4100 Echosounder	Laz4100.dll
Applanix POS M/V Network	posmv.dll
Applied Microsystems Smart Sound Velocity	SmartSound.dll
Applied Microsystems Sound Velocity Probe	Svp16.dll
Ashtech 3DF GPS	Ash3df.dll
Atlas Deso 14	Deso14.dll
Atlas Deso 15	Deso15.dll
Atlas Deso 15/17 GLDD	Deso1517GLDD.dll
Atlas Deso 17	Deso17.dll
Atlas Deso 25	Deso25.dll
AutoPilot	AutoPilot.dll
Autotg Aandera	Autotg.dll
Ceeducer Pro	CeeducerPro.dll
Channel Driver	channel.dll
Chesapeake Technologies, Sonar Wiz Output	Sonarwiz.dll
Coda Octopus	F180.dll
DCMS driver Laval	Dcms.dll
Del Norte Trisponder 542	Trisp.dll
elac 4300	
DelNorte 586 in XY mode	586xy.dll
Delph Elics Side Scan (NOAA Ouptut Only)	Elics1.dll

Device Name	Driver Name
Delph Elics Side Scan (Output Only)	Elics.dll
Digital Output Driver	Pio12.dll
Dova T75 Angle Sensor	Dovat75.dll
EdgeTech Special NMEA Sentences (Output)	Eggnmea.dll
EdgeTech Special NMEA Sentences (Output/Event)	Eggevnmea.dll
EG&G 260 Magnetometer	Egg260.dll
EG&G 876 Magnetometer	Egg876.dll
EG&G 880 Magnetometer	Egg880.dll
Elac MKII Hydrostar 4300	Elac4300.dll
Elac MKII Hydrostar 4300	New-elac4300.dll
Entek Tide Gauge	Entek.dll
EPCTape 1086	Epctape.dll
Fahrenth 32 Bit	Fahrenth.dll
Falmouth Scientific - Micro CTD	Ctd.dll
Fluorometer	Fluoro.dll
Foruno Echosounder (DPT)	ForunoDPT.dll
Furuno Video Plotter (Output Only)	Furuno.dll
GC-03 Speed & Heading	Spdhdg.dll
Generic (Configurable) Device Driver	Gendevall.dll
Generic (Configurable) Device Parser	GenDevParse.dll
Generic GPS with NMEA-0183 output	GPS.dll
Generic Serial Bubbler/Clinometer	Clinoser.dll
Generic Speed Over Water	Gensow.dll
Geodimeter (Range/Azimuth)	Geodimet.dll
Geodimeter (XYZ)	Geodmet2.dll
Geodimeter ATS	Geodats.dll
Geodimeter G877 Magnetometer	Geog877.dll
GeoMetrics 866 Magnetometer	Geom866.dll
GeoMetrics 881 Magnetometer	Geog881.dll
Geometrics 881a Magnetometer	Geog881a.dll
Geometrics G880 Magnetometer	Geog880.dll

Device Name	Driver Name
GSS20	GSS20.dll
GYRO_TRAC Device	Gyrotrac.dll
Hazen HTG-5000 Tide Gauge	Htg5000.dll
Honeywell HPR	Hhpr.dll
HPGL Online Plotter	Hpgl.dll
HPGL Online Plotter	Hpglmult.dll
HYPACK, Inc. Cable Counter	Towcable.dll
HYPACK, Inc.. Draft Table	Drafttable.dll
HYPACK, Inc. Event Mark Generator	Lpt_Tap.dll
HYPACK, Inc.. Event Mark Sounder	Beep.dll
HYPACK, Inc. Generic Device Parsing	GenDevParse.dll
HYPACK, Inc. Generic Draft	Gendraft.dll
HYPACK, Inc. Generic Echosounder	Genecho.dll
HYPACK, Inc. Generic Echosounder with warning outside depth range	Genechow.dll
HYPACK, Inc. Generic Gyro	Gengyro.dll
HYPACK, Inc. Generic Offsets	Genoffset.dll
HYPACK, Inc. Generic Simulator	Sim32.dll
HYPACK, Inc.. Generic Tide Gauge	Gentide.dll
HYPACK, Inc. Generic XY	Generxy.dll
HYPACK, Inc. Generic XYZ	XYZ.dll
HYPACK, Inc. GPS Compare	GpsComp.dll
HYPACK, Inc. HYSWEEP® Interface	Hysweep.dll
HYPACK, Inc. LCD3 Helmsman	Lcd3.dll
HYPACK, Inc. LCD4 Helmsman	Lcd4.dll
HYPACK, Inc. Manual Entry	Manual.dll
HYPACK, Inc. OTF-Gyro/ Comparison	OTFGyro.dll
HYPACK, Inc.' OutInfo	OutInfo.dll
HYPACK, Inc. Playback driver	Playback.dll
HYPACK, Inc. Simulation (Range-Azimuth/Sounder)	Testdev.dll
HYPACK, Inc. Tides (From File)	Tidefile.dll

Device Name	Driver Name
HYPACK, Inc. Tides (From File) + Adjustment	Tidefile2.dll
Innerspace 455	Inn455b.dll
Innerspace 455 (and 456)	Inn455.dll
Innerspace 440 Echosounder (Serial)	Inn440s.dll
Innerspace 448 Echosounder (Serial)	Inn448.dll
Innerspace 449 Echosounder (Serial)	Inn449.dll
Innerspace 449 rev. 2	Inn449R2.dll
Innerspace 449 Rev. 2 (Serial)	Inn449rev2.dll
Innerspace 449Rc	Inn449DFZ.dll
Innerspace 455	Inn455.dll
Innerspace LCD Helmsman	InnLCD.dll
Innomar SES-2000	SesInno.dll
Isis (Triton) Custom EOD	Isiseod.dll
Isis (Triton) Dynamic Data Exchange Interface	Hdde.dll
IT2000 Series Intelligent Pressure Transducer	IT2000.dll
Kaijo PS-20R Echosounder	Ps20r.dll
Kaijo PS-30R Echosounder	Ps30r.dll
Kel320Scsi	Kel320Scsi.dll
Klein 595 & System 2000 Side Scan (Annotation/Speed Only)	Klein.dll
Knudsen 320 (NOAA)	Noaaknud.dll
Knudsen 320M (CHS Serial)	K320s.dll
Knudsen 320M (Dual Transducer)	K320smt.dll
Knudsen 320M Echosounder (Serial)	Knu320ms.dll
Krupp Atlas Polarfix Range/Azimuth	Polarfix.dll
Krupp Atlas Polarfix Range/Azimuth (Beach Profile)	Polar2.dll
Krupp Atlas PolarTrack	Polartrk.dll
KVH Azimuth Digital Compass	Kvh_Ad.dll
KVH Digital Compass	ADGC.dll
KVH Fluxgate Compass	Kvh.dll
Laser Atlanta Range/Azimuth	Atlanta.dll
Laser Technologies Hydrolink (Modem Link)	Hydroml.dll

Device Name	Driver Name
Laser Technologies Hydrolink II (USGS)	Hydroii.dll
LaserTrack L5000 Range/Azimuth	Lt_L5000.dll
LaserTrack L5001 Range/Azimuth	Lt_L5001.dll
Leica RTK GPS	LLQ.dll
Leica Total Station	Leica.dll
Leica total station 2122	Leica2122.dll
Line Switch Input	Lineswitchin.dll
Line Switch Output	Lineswitchout.dll
Lundahl RST-1 Air Transducer	Lundahl.dll
Magnavox MX7400 DGPS	Mag7400.dll
Manual HPR	ManHPR.dll
Marimatech E-Sea Echosounder	E-Sea.dll
Marine Magnetics SeaSpy Magnetometer	SeaSpy.dll
Marine Microsystems Roxann Seabed Identification	Roxann.dll
MD TOTCO Series 2000	Mdtotco.dll
MD4S Depth Device	MD4S.dll
Measurement Technology NW LCI-90	Lci90.dll
Meconaut Bubbler System	Meconaut.dll
Minesens	Minesens.dll
Motorola Falcon	Falcon.dll
Motorola Falcon IV Range/Range	Falcon4.dll
Motorola Miniranger III (NM788 Serial Interface)	Nm788.dll
Motorola Sixgun DGPS	Sixgun.dll
Navisound 200/400 Series	Navisound.dll
Navisound 210	Navsound210.dll
Navitron Sound50 Echosounder	Sound50.dll
Navitronic Sounding 30 Echosounder	Sdig30.dll
Navitronics Dpp1b Serial Echosounder	Dpp1b.dll
Navitronics DPP2B	Dpp2b.dll
Navitronics MCS2000	MCS2000.dll

Device Name	Driver Name
Navitronics MCS2000-PWGSC Moncton	Dpp2000.dll
Navitronics PGU-1000	Pgu1000.dll
NMEA Auto Pilot	Autop.dll
NMEA In Klein Out	Nmeakl.dll
NMEA Server Client	Nmeasc.dll
NMEA SSB Position Device	SSB.dll
NMEA TKV Message (Speed/Temp)	Nmeatkv.dll
NMEA-0183 Standard GPS	Nmea.dll
Nmea-UDP	Netnmea.dll
NOAA Delph Output	Delph.dll
NOAA Isis	Isis.dll
Novatel DGPS - OEM Card	Novoem.dll
Novatel PC Card	Novatel.dll
Novatel PC Card	Novax.dll
Novatel RTK GPS	Novp20.dll
Novatel RTK GPS (CHS-OEM4)	Chsoem4.dll
NSWCLaserTrack L5000	NSWCTRK.dll
Nuclear Density Meter	Tndm.dll
Ocean Data Bathy 1500	Bathy1500.dll
Ocean Data Bathy 500	Bathy500.dll
Ocean Data DSF-6000 (NOAA)	Dsf6000.dll
Octopus460	Octopus460.dll
Odom Digitrace	Dtrace.dll
Odom Echoscan (Multi-Transducer)	Echoscan.dll
Odom Echotrac (NAVOCEANO Mod4)	Echomod4.dll
Odom Echotrack GLDD	Echotrackgldd.dll
Odom Hydro700R Range/Range System	Hydro700.dll
Odom Hydrotrac/Echotrac	Echotrac.dll
Odom MKII Multi Transducer	Mkii.dll
Odom Star (Range/Azimuth)	Star.dll
Offset Mobile Device	OffsetMobile.dll
OS200	Os200.dll
Port Capture Device	Capture.dll

Device Name	Driver Name
Precision Shot Driver	Shot.dll
PSA916	Psa916.dll
Reson Sound Velocity Probe	Svpc.dll
Rockwell Collins 3A/DGPS (Serial)	Rockser.dll
Ross 603 Echosounder (BCD)	Ross603.dll
Ross BCD Toscaloosa	Multibcdt.dll
Ross Dolphin (BCD)	Dolphin.dll
Ross MultiTrack Multiple Transducer Echosounder (BCD)	Multibcd.dll
Ross Single-Transducer (BCD)	Singlbcd.dll
Ross Smart Echosounder (Serial)	Rossmart.dll
Ross SmartSweep	Smartswp.dll
Rouen Tide System	Rouentide.dll
Scan 2000 Gyro	SC2000.DLL
Scandinavian Microsystems LR20, 40, 60	Sms.dll
SDI12 sensor unit	H419.dll
Seabat9001	Seabat.dll
Seabed Identification Devices	SeabedID.dll
Seabon PDR-130 Echosounder	Pdr130.dll
Seabon PDR-601 Echosounder (Four Channel)	Pdr6014.dll
Seabon PDR-601 Echosounder (Single Channel)	Pdr6011.dll
Seatex MRU-6 motion sensor	Mru6.dll
Seatex MRUH Motion Sensor	Mruh.dll
Seismic	Seismic.dll
Sercel Axyle (XY mode)	Sercel.dll
SGBrown Gyro	SGBrown.dll
Shanghai Suction Tube Indicator	Shtube.dll
Shanghai Tide System	Chtide.dll
Simrad (EOD)	Eod.dll
Simrad EA300 Echosounder	Ea300.dll
Simrad EA500 Echosounder	Ea500.dll
Simrad HPR410P	SimradHPR410.dll
Sitex Positioning System	Sitex.dll

Device Name	Driver Name
Smart CTD	Smartctd.dll
Sonar Research & Development Tide Guage	Sonar_Tm.dll
Sonardyne USBL Device	Sdyne.dll
SonarLite Echosounder	Sonarlite.dll
Sperry Gyro	Sperry.dll
Suction Tube Position Indicator	Stpi.dll
Suction Tube Position Monitor	Ihc.dll
Syqwest Stratabox	Strata.dll
Tangent's QTC View Seabed Classification	Qtc.dll
TDS 1000 Echosounder	Tds1000.dll
Thomas Marconi SMM II Towed Magnetometer	Smm_Ii.dll
Tianjin Cutter With Spud	Spudcut.dll
Tianjin Spud Position	Spudpos.dll
TianJing Cutter-Suction	Tjcut.dll
Tidealite Tide Guage	Tidalite.dll
TOPCON APL1A	APL1A.dll
Trackpoint II ROV Acoustic System	Trackp.dll
Trackpoint LXT ROV Acoustic System	Trkplxt.dll
Trackpoint Multivehicle Driver	Trackpoint.dll
Trimble DGPS (Special NMEA)	Trimnmea.dll
Trimble DGPS Cycle Printout Message	Trimcp.dll
Trimble Echo-XL Helmsman	Echoxl.dll
Trimble Kinematic (NMEA)	Trimkin.dll
Trimble RTK Cycle Printout	RTKcp.dll
Tripmate GPS	Tripmate.dll
Triton (EOD)	Trieod.dll
TSS Motion Reference Unit & Depth	Tss320.dll
TSS POS/MV	Posmv.dll
TSS POSMV using Simrad Message Formats	Posmv3000.dll
Turner Fluorometer	Osifloro.dll
USGS – EPC Recorder	EPC.dll

Device Name	Driver Name
USGS - IsisOut	ISISOUT.dll
USGS - Manual Draft	Mandraft.dll
USGS - Printer	Printer.dll
USGS - Slant Range	Edgetech.dll
Valeport In	Vale2.dll
Valeport InOut	Vale1.dll
Valeport Tide Gauge	Valeport.dll
Vyner-LP Tide Gauge	Vynerlp.dll
YSI 5100 Dissolved Oxygen Meter	Ysi5100.dll

DEVICES SUPPORTED BY SIDE SCAN SURVEY

TABLE 10-2. *Side Scan Drivers*

Device Name	Driver Name
Analog Side Scan	Side Scan driver
Benthos C3D	Side Scan driver
C-MAX CM2	Side Scan driver
C-MAX CM2 (USB)	Side Scan driver
Edgetech 272-T/TD	Side Scan driver
Edgetech 4100	Side Scan driver
Edgetech 4200	Side Scan driver
Edgetech 4300	Side Scan driver
GeoAcoustics Digital Side Scan	Side Scan driver
GeoAcoustics GeoSwath	Side Scan driver
HYPACK® Mobile	Additional Vessel
HYPACK® Navigation	Link to HYPACK® Survey
HYPACK® Side Scan	Link to HYPACK® Side Scan
Imaginex 881 Sportscan	Side Scan driver
Klein 3000	Side Scan driver
Klein 5000	Side Scan driver
Yellowfin Side Scan	Side Scan driver

DEVICES SUPPORTED IN HYSWEEP® HARDWARE

TABLE 10-1. *HYSWEEP® HARDWARE Drivers*

Driver	Description
Analog Side Scan	Side Scan driver
Applanix POS/MV Network	Motion Sensor
Applanix POS/MV Serial	Motion Sensor
Atlas Bomasweep	Multiple transducer driver
Atlas Fansweep (Network)	Multibeam driver using the network interface
Atlas Fansweep (Serial)	Multibeam driver using the COM port interface
Atlas Hydrosweep MD2	Multibeam driver
Benthos 162X	Side Scan driver
Benthos C3D	Side Scan driver
BlueView Multibeam	Multibeam driver
Cmax CM2	Side Scan driver
Cmax CM2 USB	Side Scan driver
Coda_Octopus F180	F180 Attitude and Positioning System
Edgetech 272-T/TD	Side Scan driver
Edgetech 4100	Side Scan driver
Edgetech 4200	Side Scan driver
Edgetech 4300	Side Scan driver
Furuno HS	Multibeam driver
Generic Attitude	Generic Pitch, Roll, Heading driver
GeoAcoustics Digital Side Scan	Side Scan
GeoAcoustics GeoSwath	Multibeam Side Scan driver
HYPACK® Mobile	Mobile Position
HYPACK® Navigation	Link to HYPACK® Survey -Main Vessel
HYPACK® Sidescan	Single Beam Side Scan
Imagenex Delta T	Delta T Multibeam driver
Imagenex DualDelta T	Dual Delta T Multibeam driver
Imagenex Sportscan	Imaginex Sportscan Side Scan driver
Imagenex Yellowfin	Yellowfin Side scan driver
IXSEA OCTANS	Motion Sensor
JAE JM7531	Motion Sensor
Klein 3000	Side Scan
Klein 3900	Side Scan

Driver	Description
Klein 5000	Side Scan driver
KVH Gyrotrac	Heading, pitch and roll driver
Marine Sonic Sea Scan	Side Scan driver
NMEA-0183 Gyro	Gyro driver for NMEA HDT messages
Odom Dual ES3	Multibeam driver
Odom Echoscan II	Multibeam driver
Odom Miniscan	Multiple transducer driver
Odom ES3	Multibeam driver
Optech ILRIS	Laser Scanner
R2Sonic	Multibeam driver
Reson Dual 7125	Multibeam driver
Reson Dual 8101 (NY)	Dual Head Seabat
Reson Seabat 7101	Multibeam driver
Reson Seabat 7125	Multibeam driver
Reson Seabat 8101	Multibeam driver
Reson Seabat 81xx (Network)	8124, 8125 and newer 8101 multibeam driver using the network interface
Reson Seabat 81xx (Serial)	8124, 8125 and newer 8101 multibeam driver using the COM port interface
Reson Seabat 9001	Multibeam driver
Reson Seabat 9003	Multibeam driver
Riegl LMS-Q120	Side scan
Ross Smart Sweep	Multitransducer
SEA SWATHplus	Multibeam driver
Seabeam 2100	Multibeam driver
Seabeam SB1000 Series	Multibeam driver
Seatex MRU6	Heave, pitch and roll driver
SG Brown 1000S Gyro	Gyro driver
Simrad EM1002	Multibeam driver
Simrad EM2000	Multibeam driver
Simrad EM3000	Multibeam driver
Simrad EM3002	Multibeam driver
Simrad EM 3002D	Multibeam driver
Simrad EM 302	Multibeam driver
Simrad EM 710	Multibeam driver
Simrad SM2000	Multibeam driver

Driver	Description
Tritech SeaKing	Scanning sonar
TSS 335	Heave, pitch and roll driver
TSS DMS	Heave, pitch and roll driver
TSS Pos/MV	Pos/MV Heave, pitch, roll and heading driver

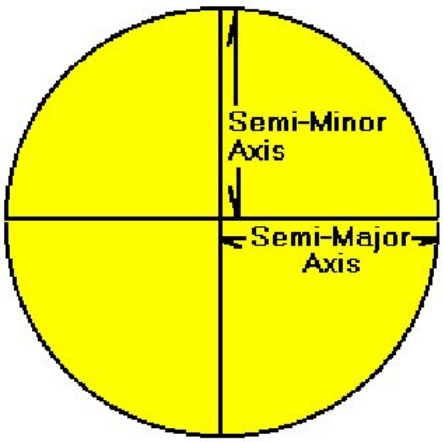
GEODESY

Geodesy is the science of determining your position. Since the earth's surface is very irregular, it would be impossible to develop a set of equations that describe it. In order to simplify things, hydrographers use a mathematical shape called an ellipsoid for their reference surface.

ELLIPSOIDS

Ellipsoid – A mathematical surface created by rotating a 2-dimensional ellipse about its axis. Examples of ellipsoids include WGA-1984, International, Clarke 1866 and Bessel.

FIGURE 10-1. *An ellipsoid defined by the semi-minor and semi-major axes*



An ellipsoid is normally defined by its semi-major axis (a) and its semi-minor axis (b). The semi-major axis (a) and the flattening (f) also often define them. The flattening is a ratio of the difference between the two axes, divided by the semi-major axis.

$f = (a-b)/a$

The semi-major and semi-minor axes are normally expressed in meters. The flattening is often expressed as the inverse (1/f) of the flattening.

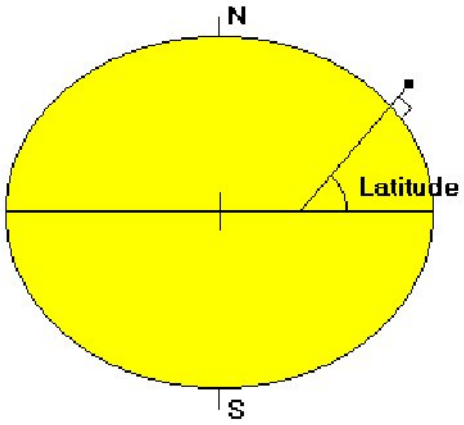
Sample values for some common ellipsoids are:

Ellipsoid	a (m)	b (m)	1/f
Bessel	6,378,206.4		299.1528128
Clarke 1866	6378206.4		294.9784982
Clarke 1880	6378249.145		293.465
GRS 1980	6378137.0		298.25722101
Everest	6377276.345		300.8017
International	6378388.0		298.0
WGS 1972	6378135.0		298.26
WGS 1984	6378137.		298.257223563

Your position on the ellipsoid is defined with three variables:

- **Latitude:** Your Latitude is the angle that a line drawn from your position normal (perpendicular) to the ellipsoidal surface makes with the ellipsoidal equator.

FIGURE 10-2. *Defining Latitude on an Ellipsoid*



- **Longitude:** Your longitude is the polar angle of your point, measured counter-clockwise from a user-defined reference. For many ellipsoids, this reference is the Greenwich meridian (0).
- **Height:** The height is the distance from your point to the surface, measured along a line, which is normal (perpendicular) to the ellipsoidal surface.

Your latitude, longitude, and height will differ, depending on the ellipsoid used as your reference surface. In other words, a single point can be described with a different latitude, longitude and height combination for each ellipsoid you create.

Ellipsoids are chosen so they conform to the shape of the geoid for a user's area.

GEOIDS

A geoid is an equipotential surface, meaning the pull of gravity measured anywhere on the surface is equal. Base on the surrounding mass (mountains, canyons, etc.), this surface rises and falls and is much more irregular than an ellipsoid, although much smoother than the earth's surface.

One of the important features about a geoid is that a plumb bob always points normal (perpendicular) to the geoidal surface. It does not point directly to the center of the earth. This means that your local land measurements will be affected by the local geoidal surface. In order to reduce the errors caused in computing positions on the ellipsoid using measurements affected by the geoid, the ellipsoid is shifted so it closely matches the geoid in your local area. When this is done, it becomes a datum.

TABLE 10-1. *Choosing your Geoid Model*

Geoid	Geoid File Name	Area Covered
CONUS	g200#u01.geo	40-58N, 230-249E
	g200#u02.geo	40-58N, 247-266E
	g200#u03.geo	40-58N, 264-283E
	g200#u04.geo	40-58N, 281-300E
	g200#u05.geo	24-42N, 230-249E
	g200#u06.geo	24-42N, 247-266E
	g200#u07.geo	24-42N, 264-283E
	g200#u08.geo	24-42N, 281-300E
Alaska	g200#a01.geo	15-21N, 291-296E
	g200#a02.geo	60-72N, 202-234E
	g200#a03.geo	49-61N, 172-204E
	g200#a04.geo	49-61N, 172-204E
Hawaii	g200#h01.geo	18-24N, 199-206E
Puerto Rico/Virgin Islands	g200#p01.geo	15-21N, 291-296E
Australia	ausgeoid98.geo	46-8S, 108-160W
Baleares Islands	BALR2009.geo	38°N to 40° 48', 0° 50'E to 4° 40'E
Canada	HT2_0.geo	
Canarias Islands	egm08canarias.geo	27°30'N to 29°30'N, 18°30'W to 13°W
France	raf98.geo	42-51.5N, 5.5E-8.5W
	raf09.geo	
Mexico West	mex97w.geo	14-32.9981N, 106.0013-119E
Mexico Central	mex97c.geo	14-32.9981N, 96.0013-109E

Geoid	Geoid File Name	Area Covered
Mexico East	mex97e.geo	14-32.9981N, 86.0013-99E
Netherlands	nap04.geo	50.525-53.675N, 3.2083-7.4583W
Portugal	geodpt08.geo	36.513-42.238N, 10.012-5.987E
Peninsular Spain, Baleares Islands, Ceuta and Melilla	egm08ign.geo	35°N to 44°N, 9°30'W to 4°30'E
South Africa	sageoid.geo	35 to 22S, 16 to 33E
UK	osgm02.geo	49.7661-60.8772N, 9.39E-3.4433W

DATUMS

A datum is an ellipsoidal surface, which has been moved to closely match the geoidal surface for a user's area.

When you move your ellipsoid to create a datum, you are also affecting the latitude, longitude and height above the ellipsoid of your point. When someone describes a position location to you with latitude, longitude and height, you don't know anything until you know which datum was used to define the point and which ellipsoid the datum is based upon.

Example #1: Say that your friend confesses to you on his deathbed that he robbed a bank and buried the money at exactly 45N and 78W. You had better quickly ask him what his reference datum was, or you are going to be digging a long time!

Example #2: An oil company pays you a lot of money to survey between 26 00N and 72 00W and 26 01N and 72 01W. Since they are a modern survey company, you assume they are working on WGS-84 and go out and perform the survey. When you get back home, you find out they are working on the Everest ellipsoid and you should have been surveying an area 2 miles to the south.

DATUM TRANSFORMATIONS

There is always a need to be able to convert a latitude, longitude and height from one datum to another. This is performed with a datum transformation.

For example, your DGPS provides you with a position in WGS-84. Your survey is being performed on NAD1927. In order to convert the position from WGS-84 to NAD1927, you need to perform the datum transformation.

Datum transformations can be performed using several different methods. Among them are the geocentric, regression formulae, exact, and numerical difference techniques.

THREE-PARAMETER DATUM TRANSFORMATION

In geocentric methods, the latitude, longitude and height above the ellipsoid are converted to Cartesian XYZ coordinates using the center of the ellipsoid as the origin. These are referred to as "geocentric coordinates". Based upon the separation between the centers of the two datums, an offset is added to each coordinate to "shift" them from the first datum to the second datum. The geocentric coordinates for the second datum are then converted back into latitude, longitude and height using the ellipsoidal constants for the second ellipsoid.

In summary:

$Lat_1/Long_1/H_1 \rightarrow X_1, Y_1, Z_1, \rightarrow X_2,Y_2,Z_2 \rightarrow Lat_2/Long_2/H_2$

To go from X_1, Y_1, Z_1 to X_2, Y_2, Z_2, we added a dX, dY and dZ to each specific value. This is called a three-parameter shift and is typically used for only a local area (10km). The same process is performed in a technique known as the Molodensky Formulae. The Abridged Molodensky Formulae is very similar, but eliminates a few variables while giving almost the same result.

To obtain these dX, dY and dZ values, users can either look up published information (such as DMA TM 8511) or calculate them. To calculate them, you need to know the latitude, longitude and height for the same point in the two different datums. Calculate the geocentric coordinates for both points, using the ellipsoidal parameters associated with each datum. Take the difference between the X1 and X2 values to determine the dX parameter. Repeat the same for the dY and dZ parameters. Voila, you have computed the exact datum transformation parameters for your area.

The dX, dY, and dZ values used in a datum transformation are typically valid for a small area (10 km X 10km?). As you move further from your area, the values change as the relationship between the two ellipsoids change.

SEVEN-PARAMETER DATUM TRANSFORMATION

To cover a wider area, a seven-parameter datum transformation can be used. A seven-parameter transformation contains, the dX, dY and dZ values mentioned above, as well as Θ_X, Θ_Y and Θ_Z and dScale values. The Θ values represent the difference in alignment of the X-, Y-, and Z-axis of the two ellipsoidal geocentric axes. The dScale represents difference in scale measured between the two systems.

The advantage of a seven-parameter datum transformation over a three-parameter datum transformation is that it is valid for a much larger area. Many countries, such a Saudi Arabia publish a single seven-parameter datum transform, which is used for the entire country.

REGRESSION FORMULAS

Regression Formulas are also used to convert between specific datums. The transformation is achieved by using the latitude, longitude and height above ellipsoid on the output datum.

Although quite handy for computer programs, regression formulas are not widely implemented. A main problem is you must have a separate regression equation for each set of datums you wish to transform between. An additional problem is that regression equation coefficients are computed using actual data sets. If you have sparse data, your results may not be accurate away from your data points. Regression equations also tend to "smooth" through local abnormalities.

EXACT FORMULAE

The relationship between certain datums can be described by exact formulae. One of the primary examples of exact formulae is the conversion between WGS-1972 and WGS-1984.

NUMERICAL DIFFERENCE TECHNIQUE

Another method for datum conversion is the numerical difference technique. A primary example of this technique is the DANCON transformation routine used throughout the U.S. Army Corps of Engineers (USACE). Using a huge set of test points, USACE developed a gridded model of the difference between NAD 1927 and WGS-84 latitude/longitude/heights. Based on a users position, NADCON determines the surrounding difference in latitude/longitude/height for the four corners of the grid cell containing your position and then interpolates the dLat, dLong and dHeight for your point. Although limited for use between WGS-84 and NAD-27, NADCON serves as the datum transformation engine for the CORPSCON program that has a large group of users.

PROJECTIONS

A projection is a flat (2-dimensional) representation of a 3-dimensional surface.

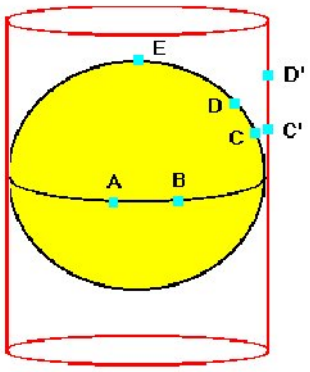
In order to present hydrographic data on flat, easy-to-store charts, hydrographers have always been faced with the challenge of accurately

representing the real world in two dimensions. To accomplish this task, a projection is used. The key to choosing a good projection is to minimize the amount of distortion that takes place when moving between the real world and the flat chart.

MERCATOR PROJECTION

Most projections are based upon either cylindrical or conical shapes. In the figure to the right, the ellipsoid has been wrapped by a giant cylinder that "touches" the ellipsoid at the equator. If there was a light source at the center of the ellipsoid, all points on the ellipsoidal surface could be projected somewhere on the cylinder. For example, point D on the ellipsoid in the figure below would be projected to D^1 on the cylindrical projection.

FIGURE 10-3. *Mercator Projections*



Since points A and B are on the line of coincidence (where the ellipsoid touches the cylinder), the ellipsoidal distance between A and B would equal the projection distance. In this case, there would be no distortion between distances measured on our map and the ellipsoidal distance.

Point C is projected to C^1 and point D is projected to D^1. It is easy to see that the projection distance, in this case, will be greater than the ellipsoidal distance. The ratio of the projection distance divided by the ellipsoidal distance is called the line scale factor. With no distortion (AB), this has a value of 1. When the projection has "stretched" the ellipsoidal distance, as in the CD to C^1D^1 case, the line scale factor is greater than 1.

When the projection has "compressed" the ellipsoidal distance, the line scale factor is less than 1. As lines on the projection become smaller and smaller, they become a point and hydrographers will refer to a point scale factor. This is a measure of the distortion of the projection at that point.

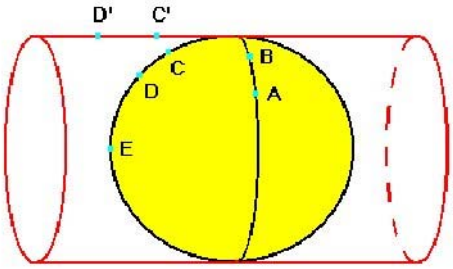
In Figure 10-3, notice that point E, on the ellipsoidal North Pole cannot be projected onto this cylinder. The further north/south from the ellipsoidal equator, the greater the distortion, until it becomes infinite at the poles. This example shows the basis behind the Mercator projection. By studying the figure, you can see there is little distortion in a Mercator projection about the equator. As you go further south/north from the equator, distortion soon becomes large. At 45^{o}N, the point scale factor on a Mercator projection is 1.41, which means that 10,000 meters in the real world would be represented as 14,100 on your nautical chart.

Points on the projection are usually referred to by easting (X) and northing (Y). The easting is the projection distance from a user-defined reference meridian (line of longitude). The northing is the projection distance from a user-defined reference parallel (line of latitude). Distances are usually denoted as positive to the north of a parallel and to the east of a meridian. In order to avoid working with negative numbers, a false northing and/or false easting are sometimes added to the projection distances to come up with a final easting and northing.

TRANSVERSE MERCATOR PROJECTION

In order to reduce distortion away from the equator, a transverse mercator projection can be used. In a transverse mercator projection, the cylinder is rotated 90^{o}, as shown in the figure below. The cylinder is co-incident (touches) the ellipsoid along a north-south meridian. This north-south meridian is called the central meridian.

FIGURE 10-4. *Transverse Mercator Projection*



In Figure 10-4, since points A and B fall on the central meridian, the ellipsoidal distance will equal the projection distance. As you move away from the central meridian, the difference in ellipsoidal and projection distances will begin to increase. The ellipsoidal distance between points CD is much less than the projection distance. Point E, which is 90^{o} in

longitude from the central meridian and on the equator, will not project onto the cylinder.

UNIVERSAL TRANSVERSE MERCATOR (UTM) PROJECTION

A special case of the transverse mercator projection is the Universal Transverse Mercator (UTM) projection. By a convention that has been accepted around the world, the UTM system divides the world into six-degree zones, beginning at the Greenwich Meridian.

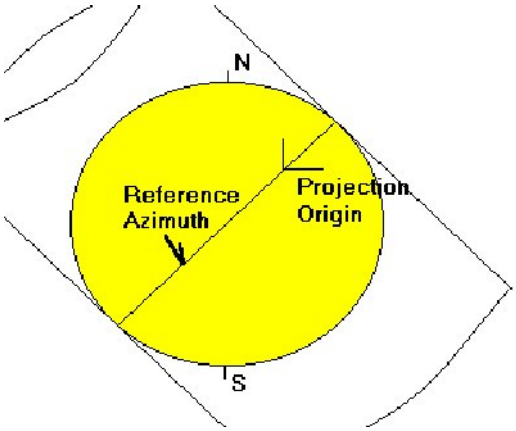
Each six-degree zone has a central meridian located midway between the zone limits. For example, the UTM zone from W72 to W78 has a central meridian of W75. The nothing is the projection distance from the reference latitude (equator) and the easing is the projection distance from the central meridian of W75. The nothing is the projection distance from the reference latitude (equator) and the easing is the projection distance from the central meridian. A false easing of 500,000 meters is added to all easing values. A false nothing of 10,000,000 meters is added to all nothings calculated in the soother hemisphere. Since the projection distance to a point in the Southern Hemisphere will be a negative number, this results in a northing valueless than 10,000,000.

In order to reduce the amount of distortion on the outer edges of a UTM projection, the point scale factor along the central meridian is defined as .9996 meters on my chart. As I move away from the central meridian, I will pass through a curved line where the point scale factor is 1.0. On the outer reaches of a UTM projection (3^{o} from the central meridian), the point scale factor at the equator is 1.00098 (10,000 meters along the ellipsoid would be represented by 10,009.8 on the projection. If a value of 1.000 was used as the scale factor along the central meridian, the point scale factor along the outer reaches would rise to 1.00138. By accepting a bit of compression along the central meridian, we have reduced the amount of stretching needed at the outer limits of the projection. UTM projections are used from 80^{o}N to 80^{o}S. Although there is no distortion along the central meridian in the polar regions, the distortion begins to become unacceptably large as you move to the edge of the zone.

Some countries, such as Canada, use a modified UTM system. In Canada, the zones span only 3^{o} of longitude.

OBLIQUE MERCATOR

FIGURE 10-5. *Oblique Mercator Projection*

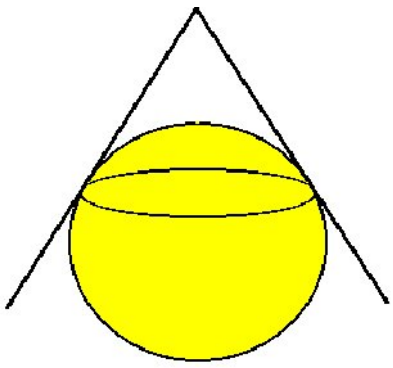


The Mercator projection is favorable for maps that span east-west along the equatorial region. Transverse Mercator projections are favorable for regions that span north-south areas. Some areas that don't run primarily east-west or north-south use a cylindrical projection where the cylinder is rotated so the line of co-incidence runs through the center of their area. This is called an Oblique Mercator projection. Examples of oblique mercator projections include Alaska Zone 1, Malaysia and Brunei national grids. The projection is defined by a Reference Azimuth that passes through a Reference Latitude and Longitude (Projection Origin).

CONICAL PROJECTIONS

One of the more popular conical projections is the Lambert Conformal Conic (LCC) projection. Many state plane zones in the USA which cover states with large east-west distance use LCC projections. This projection uses a cone shape that is co-incident with the ellipsoid in either one or two parallels.

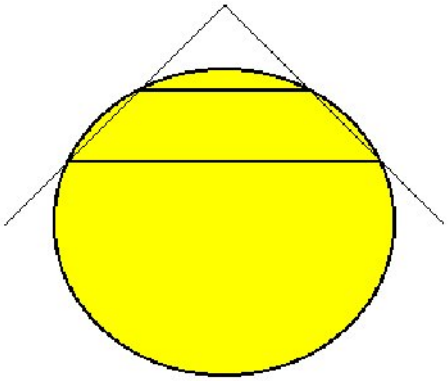
FIGURE 10-6. *Conical Projection With One Line of Incidence*



The projection is normally defined with either a single or two parallels (north and south). Northings are measured from a reference latitude and eastings are measured from a central meridian.

The point scale factor along the line(s) of co-incidence is normally equal to one, meaning there is no distortion between the projection and the ellipsoidal distances. In LCC projections with one line of coincidence, the point scale factor increases as you move away from that line. In LCC projections with two lines of co-incidence, the point scale factor will be less than one (compression) in the area between the two lines and greater than one (stretching) outside that area. LCC projections with two lines of co-incidence are used to expand the north-south area that can be covered by the projection, while reducing the overall distortion at its edges.

FIGURE 10-7. *Conical Projection With Two Lines of incidence*



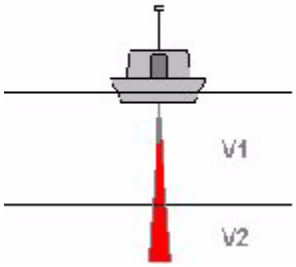
BASIC ACOUSTICS FOR THE HYDROGRAPHER

Single beam, multi-channel, and multibeam echosounders all rely upon sound waves in order to measure depth 1. They are hydrographic stopwatches that accurately measure the time it takes a sound wave to travel from the transducer to the bottom and back. Based on sound velocity parameters, they convert this time to a depth. This depth must then be corrected to account for the effects of changing sound velocity and tide, the motion of the vessel, and device latency.

SOUND VELOCITY AND RAY BENDING

Let's start with a very brief review of single beam acoustics. A sounding starts when the echosounder electronics sends a short voltage pulse to the transducer, which converts the electrical energy to a mechanical energy in the form of an acoustic (sound) wave in the water; a ping. The transducer focuses the ping downward and almost all the energy of the ping travels within a beam, as shown in Figure 10-1.

FIGURE 10-1. *Single Beam Sounding Through Sound Velocity Change. No change in the beam direction occurs.*

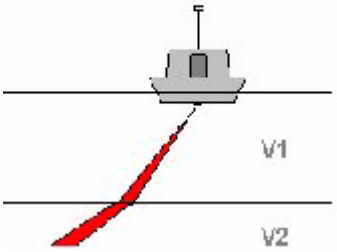


The ping travels at the speed of sound in water. Where the sound velocity changes due to temperature or density variations, like at the boundary between velocities 1 and 2, the ping speed changes. A very small portion of the energy is reflected back upward, but the ping still travels straight down; there is no change in direction.

When the ping reaches the bottom, it encounters a large change in velocity (V3). This is because sound travels much faster in the solid bottom than it does in a liquid. A large amount of the ping energy is reflected (echoed) upward at this transition and eventually finds its way back to the transducer. The transducer converts the reflected sound back to the electrical energy. From the time delay between the outgoing and incoming pulses (and known acoustic velocity in water), depth is calculated.

Now, we take a look at multibeam sonar. In multibeam technology, a beam is sometimes called a ray, which is a mathematical term for a line with a direction. In the single beam case above, it is two directions, first down then up.

FIGURE 10-2. *Multibeam sounding through sound velocity change; the beam is refracted upward. (V2 is greater than V1)*

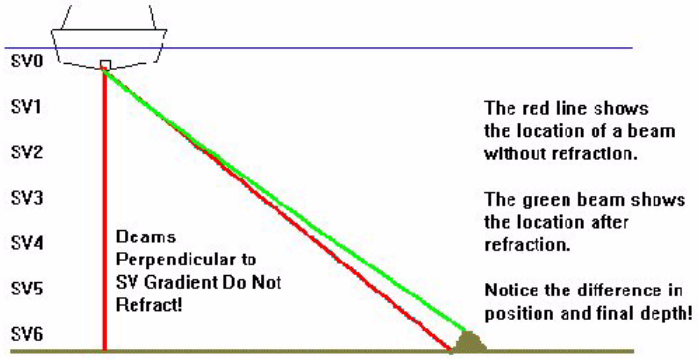


With multibeam, the beams are not necessarily vertical, and that changes the situation. When a non-vertical beam encounters a change in sound velocity, not only does the ping change speed, the beam (ray) changes direction slightly. This effect is known as refraction or ray bending. When sound velocity increases (v2 > v1), the ray is bent upward. Conversely, when the sound velocity decreases (v1>v2), the ray is bent downward. Snell's Law gives the magnitude of refraction.

V1/Sin(theta 1) = V2/Sin(theta 2) where theta 1 and 2 are the vertical ray angles in V1 and V2 respectively.

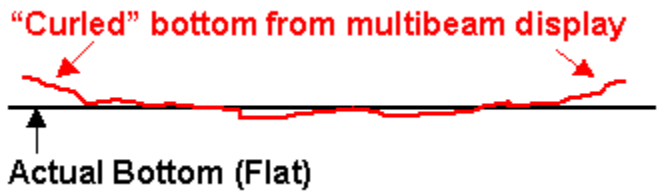
In Figure 10-3, two examples are illustrated. A single beam system pointed directly below the boat and a beam from a multiple transducer system angling through the water column. The Svn numbers represent the different sound velocity layers. Since the single beam is traveling perpendicular to the sound velocity layers, it will not be refracted. The (lower) red line on the multibeam shows the path of the beam without ray bending. The (farthest right) green line shows its actual path after being refracted. Notice you receive a different position and different depth, based on the effect of ray bending.

FIGURE 10-3. *The Effect of Sound Velocity Error in Positioning*



The largest source of errors in multibeam surveys is attributed to sound velocity measurements. You can typically see errors in sound velocity measurements in real time by noticing a "curling" effect on the outer beams when over flat bottoms.

FIGURE 10-4. *Effects of Sound Velocity Error on your Sounding Data*



Sound velocity variations are most extreme in deep water surveys where thermal effects lead to large velocity variations. In shallow water, variations are significant in estuaries where velocity changes abruptly between fresh and salt water. Where the water is well mixed, refraction is typically not a problem.

Refraction will not introduce large errors in sounding data, even if the velocity table is not quite right, as long as the vertical ray angle doesn't go too far beyond 45 degrees. (Under these circumstances there is less than 1- percent error, vertical and horizontal.) Beyond 45 degrees, however, the error will increase rapidly. If you have collected data in an area where the bottom is reasonably flat, but the outer beams are consistently shallower (or deeper) than the inner beams, you can be sure that refraction is being improperly compensated. The likely reason is erroneous sound velocity measurements.

How does this affect survey operations? Mainly, it makes the bar check procedure obsolete, which is only good for finding average sound velocity. What you will do instead, is cast a sound velocity probe to measure actual velocity variations with depth. The Velocity vs. Depth information is entered into a table that is used during post-processing to compensate for refraction.

BEAM FREQUENCY EFFECTS ON SURVEY DATA

As the frequency of your EM wave increases, so does the precision of your measurement. Put hydrographers' terms, the higher the frequency of your transducer, the more accurate your measurement will be. High-resolution side scan sonars use frequencies of 500KHZ. Multibeam systems for small launches use frequencies from 200KHZ to 450KHZ. Traditional single beam echosounder use frequencies around 200MHZ. Some hydrographers (for reasons to be discussed) use transducers with 24KHZ to 33KHZ. After reading this, you think everybody would be using 500KHZ transducers, but there is a price to pay for precision.

The higher the frequency of the EM wave, the greater the energy dissipation. As sound waves travel through water, their energy is dissipated by particles in the water, air bubbles, etc. High frequency sound waves quickly dissipate and cannot be used in deeper water. Deep-water transducers, used to measure depths of greater than 1000 meters, are typically in the range from 3KHZ to 12KHZ. Although not as precise as 200KHZ transducers, they can produce sound waves that can get to the bottom and back without dissipating.

The higher the frequency, the higher the reflectivity. One of the drawbacks with higher frequency (200+KHZ) transducers is they reflect off almost anything. This includes vegetation, air bubbles, fish bladders, and suspended sediments. A lower frequency transducer (e.g. 24KHZ), although slightly less precise, will allow you to pass through some of these materials to actually track the bottom. Over a soft mud, sand, silt) bottom, a low frequency transducer will generally provide deeper depths than a high frequency transducer. Over a hard (rock) bottom, the two transducers should produce almost the same depth.

The lower the frequency, the larger the transducer. The physical size of transducers has certainly been reduced over the last decades. However, this rule generally still holds true. Lower frequency transducers are heavier and larger than higher frequency transducers and sometimes can complicate the mounting procedures.

BEAM GEOMETRY

The equipment required for a single beam survey is a positioning system, an echosounder and, if the water is choppy, a heave compensator. Mount the position antenna above the transducer, and the sounding x and y are the same as antenna x and y. Depth (z) is the sounding minus heave. It's simple.

For accurate multibeam surveying, you need some additional equipment: a gyro to measure boat heading and a MRU (motion reference unit) for the pitch and roll data. The reason for the additional measurements is, again, because the directed beams are not vertical so calculation of the

sounding x, y**, and z values becomes more complex than in single beam surveys.**

NOTE: MRU and Heave Compensator are interchangeable terms, although MRU more accurately describes what these things do.

Once again, we will refer to some figures, each showing a single beam, to explain some basic concepts. Figure 10-5 shows a beam taking off from the multibeam at 45 degrees. The survey boat is rolling r degrees so the angle that we need to know is r + 45 degrees, which is only known from the measurement of the MRU.

FIGURE 10-5. *Looking starboard, the Beam Angle Relative to Vertical is the Boat Roll Angle*

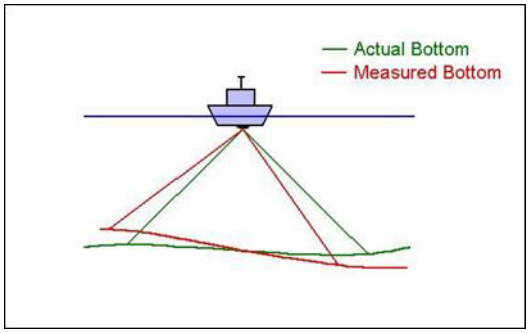
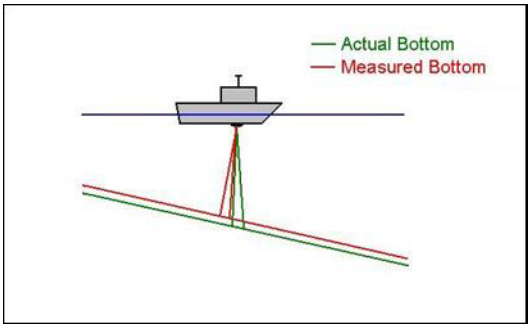


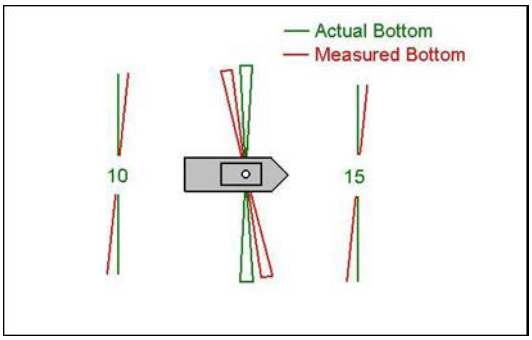
Figure 10-6 shows the necessity of pitch measurement. Although the beam takes off vertically from the multibeam, the boat is pitched and the angle required for the sounding point is p.

FIGURE 10-6. *Beam Angle relative to Vertical is the Pitch Angle*



The final angular measurement is the gyro heading (yaw) angle (h) as shown in Figure 10-7.

FIGURE 10-7. *Beam Angle relative to Grid North*



There are other angles to consider that have to do with the relative alignment of the gyro, MRU and the multibeam itself. In a perfect world, all three instruments are mounted vertically and in exact alignment with the keel of the boat. Welcome to the real world, where nothing is exact and we have magnetic variations and mounting offset angles to accommodate. These offset angles must be added to the beam roll, pitch and heading angles. Note that it is nearly impossible to measure these angles accurately enough for survey quality data. That's why the Patch Test is done -- to let the computer figure out the angles for you.

Solving for sounding x, y, z requires a few steps, and is outside the scope of this introductory course. It's enough to say, the equations are ugly, but they work!

What happens in the case of misalignment? That is, when beams are traveling at different angles than expected. The answer: Horrible things! The following table gives vertical and horizontal errors at various beam angles due to a two-degree misalignment in 40 feet of water. Think about two degrees. That's a very small angle, but look at the vertical (depth) errors that are introduced. The conclusion is, not to forget about multibeam surveying altogether, but rather to do a good patch test to make sure misalignment errors are removed.

Expected Angle	Actual Angle	Vertical Error	Horizontal Error
0	2	0.02	1.40
10	12	0.27	1.40
20	22	0.53	1.39
30	32	0.84	1.39
40	42	1.20	1.38
45	47	1.42	1.37
50	52	1.69	1.37
60	62	2.44	1.36
70	72	3.86	1.33
80	82	7.95	1.26

TIMING AND LATENCY

As we have seen, a multibeam boat is equipped with numerous devices—a positioning system, a gyro, an MRU and the sonar itself. Each device does a good job at its specialty, measuring and transmitting to the data collection computer, some at very high data rates. The computer stores all this data, with time tags indicating time of measurement, in RAW data files.

The time tags correlate the data from the various devices. To find a sounding position at a given time, it is necessary to know the pitch, roll, heading and GPS position at the exact time of the sounding. The measurements are asynchronous, so interpolation is required, using the values just before and just after the sounding. These time tags are easily overlooked, but they are just as valuable as the measurements themselves particularly when dealing with highly dynamic data, such as +/- 10 degrees of roll over a three-second period.

Admittedly, there isn't much you can do about system timing except (1) to sample devices often and (2) account for device latency.

UPDATE FREQUENCY

The more frequently devices are sampled, the better. It is far preferable to have too much data than not enough. In HYPACK®, this means setting the update frequency to the maximum value of 50 milliseconds for all devices.

LATENCY

Latency is the time delay between measurement and transmission to the data collection computer. Some devices measure, then spend time processing or waiting for additional input, then transmit after a delay; these devices have latency. Some devices measure then transmit after an insignificant time delay, in which case the latency time is zero. Other devices have predictive filters that predict the value at time of transmission, and therefore have zero latency also. Some devices transmit after a delay, but include latency in the transmission.

Latency is subtracted for the time tag to give time of measurement. When latency is wrong, the time tag is wrong and the correlation between devices is wrong so the data is wrong. It is clear that you must know latency values either from the device manual or Tech. Support, a patch test (for positioning systems) or HYPACK, Inc..

Some serious errors can be introduced by latency. We can relate positioning and latency with the following equation:

Position = Survey Speed x Latency Error

TABLE 10-1. *Horizontal Error Introduced by Incorrect Latency in the Positioning System at Various Survey Speeds*

Latency Error	@ 3 Knots	@ 6 Knots	@ 10 Knots
250 Msec	1.3 ft	2.5 ft	4.2 ft
500 Msec	2.5 ft	5.1 ft	8.4 ft.
1000 Msec (1 sec)	5.1 ft	10.1 ft.	16.9 ft.

With almost all devices, the latency delay is either negligible of included as part of the transmission. The exception is GPS devices. There are two ways to correct for GPS latency. The first is to look up latency in the GPS manual and enter it in the HARDWARE program when you specify the GPS Offsets. This works well if the latency time is constant or only varies by a small amount or if you survey slowly.

The second way to correct for latency is to use the T0 pulse from the GPS receiver. This is the only way to properly correct for latency when latency time is variable.

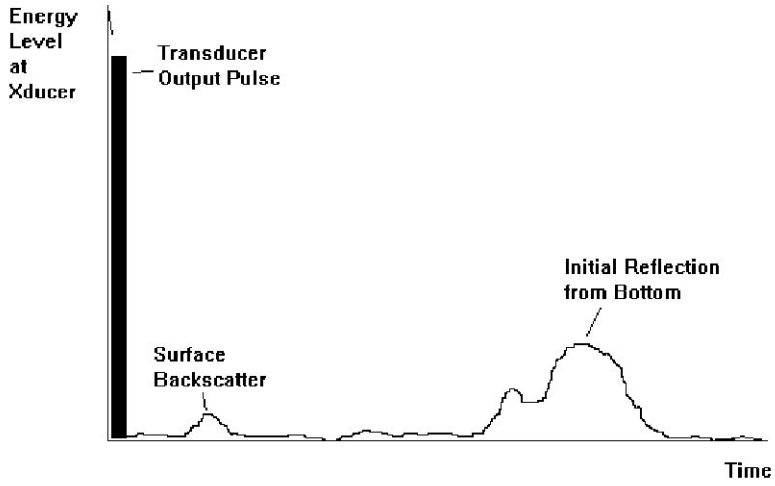
Update frequency is how often the SURVEY program checks for device data. Use 50 milliseconds for all devices with one exception. If you are surveying in calm water, you can reduce the size of your data files by decreasing the MRU update frequency. You will have to experiment to find a value that reduces files size while providing acceptable data quality.

ECHOSOUNDERS 101

HOW ECHOSOUNDERS WORK

The digitizer of an echosounder is a sensitive device that, when properly calibrated, gives accurate estimations of the bottom depth.

FIGURE 10-1. *A Typical Echosounder Reading*

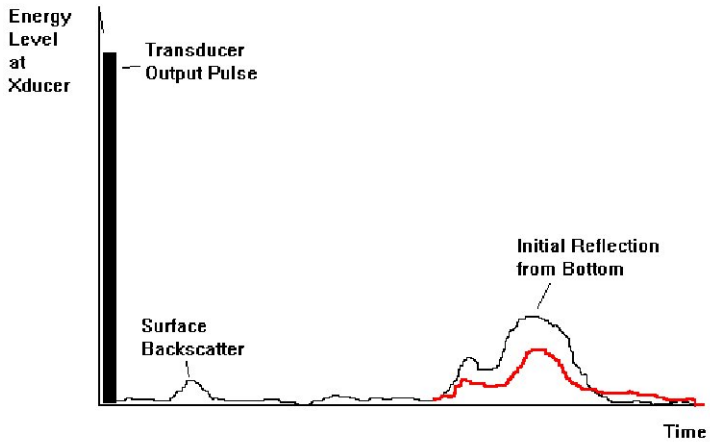


At the beginning of the measurement phase, the echosounder transceiver sends electrical energy to the transducer. This energy is converted to a sound wave by the transducer and an output "Pulse" is broadcast through the water column. Not all of the sound energy travels downward. Some of it is formed into side lobes that can actually reflect off the water surface and return to the transducer, providing the "Surface Backscatter" energy measured at the transducer.

As the sound wave strikes the bottom, energy is reflected from the bottom and redirected to the transducer where it is converted back into electrical signals by the transducer and returned to the transceiver for analysis. The amplitude (height) of the reflected energy depends upon the size of the output pulse and the reflectivity of the bottom. The more energy your transducer puts into the water, the more energy will be reflected back to you. The harder (or more reflective) the bottom, the more energy will be returned to you.

The following figure illustrates the difference between hard bottom and soft bottom energy returns using the same output pulse. The harder rock returns more energy over a shorter interval. The sand "diffuses" the sound energy, absorbing some and spreads out the period of the return.

FIGURE 10-2. *Comparing Echosounder readings over different Bottom materials*

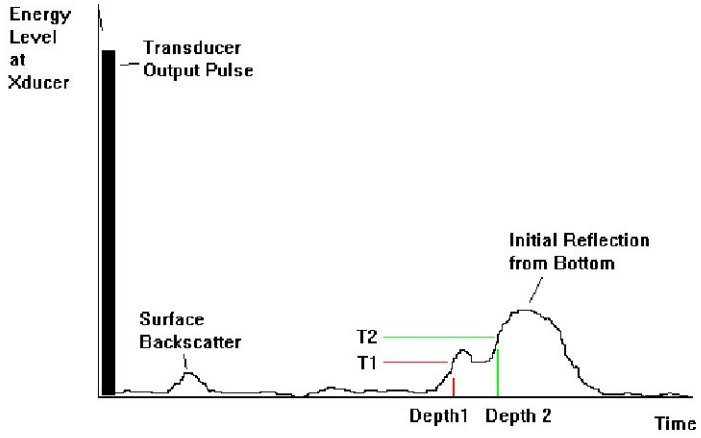


Most electronic digitizers on echosounders use a “Threshold” or “Sensitivity” setting to determine the energy level of the return signal that represents the bottom. Examine the following diagram. The Threshold is set at the “T1” level. This results in a measurement shown as “Depth 1”. If we raise the threshold to the “T2” level, the depth will increase to “Depth 2”. We can influence the depth by adjusting the digitizer threshold. In the "Rock/Sand” example, it can also be seen that we will receive slightly different depths over different material using the same digitizer threshold.

Beware!

BEWARE! If you calibrate your echosounder over hard rock and then conduct your survey over a sandy bottom, you can introduce errors into your depth measurement!

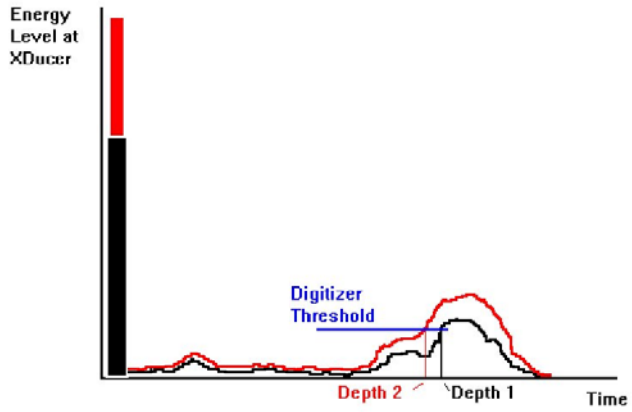
FIGURE 10-3. *The Influence of Digitizer Threshold on Depth Readings*



We can also influence the depth by controlling the amplitude of the output pulse. Examine the figure below. With the echosounder outputting power in the black (Depth 1) setting, the digitizer analyzes the return data and sets the depth where the reflected energy is greater than the Digitizer

Threshold at “Depth 1”. We then increase the output power to the red (Depth 2) setting. The reflected energy also increases in amplitude and it exceeds the Digitizer Threshold slightly earlier. This results in the echosounder outputting “Depth 2”. As you increase the output power on your echosounder, you can potentially decrease the measured depth. The inverse of this is also true. Decreasing the output power can result in increased depth measurements.

FIGURE 10-4. *Comparing Echosounder Readings at Different output powers*



BEAM PATTERNS

Based on the transducer design, echosounders produce different shaped beams. Some beams are narrow; some are wide. Most transducers have a beam pattern that shows the energy levels at various angles and signal strengths (dB levels). Most echosounders used in hydrographic surveying have a main beam that is directed perpendicular from the transducer ace plate. Two “side lobes” form at angles from the main beam. The typical pattern of a transducer beam pattern is shown in the figure below.

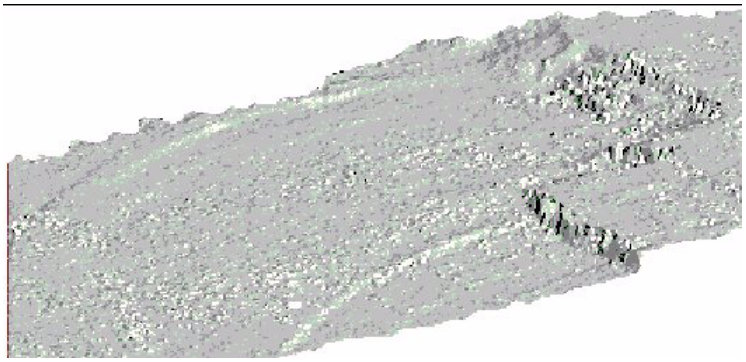
FIGURE 10-5. *Transducer Beam Angle*

The “beam angle” of a transducer is determined by measuring the range of the 6dB level. In this example, the transducer would have a beam angle of 8 degrees.

MULTIBEAM SURVEY ADVANTAGES

So you're interested in multibeam surveying. Known also, at times, as sweep, swath, multi-transducer and full coverage surveying. There is never a shortage of terms and buzzwords, but a picture is worth a thousand words, so take a look at the following figure and see what multibeam surveying is about.

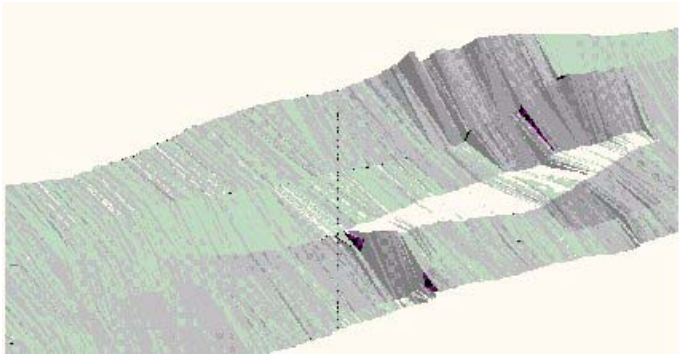
FIGURE 10-1. *TIN Model of 6 lines of multibeam sonar data. The sonar is a hull-mounted, Reson Seabat 9001, collected, processed and modeled entirely by HYPACK®/ HYSWEEP® . Data collection courtesy of USACE, Los Angeles District.*



This lunar-looking image shows dredging progress at the entrance of Los Angeles Harbor. While the image is presented three dimensionally with artificial illumination, the data from which the image is created is accurate to IHO standards bathymetrically.

What an advantage it is to have this type of technology. If this area were surveyed with a traditional single transducer boat, what would it look like? The answer is shown below. I wonder if the volumes would come out the same?

FIGURE 10-2. *TIN Model of the same data shown before, using only the nadir (vertical) beam.*



So the figures show why there is so much interest in multibeam surveying. If it was cheap and easy, we would all be working on multibeam boats and processing multibeam data. There must be a catch. Well, yes, I suppose there is.

You will pay considerably more for a multibeam than for a single beam system. But cost justification is usually not the concern of surveyors, so let's not worry about that.

Are multibeam systems easy to use? That's a yes-and-no type of question. When everything is working well, it is just as easy to collect multibeam as single beam data, in many cases easier. It's the part about getting things to work well that's a bit harder. Also, the office people will be working with much more data than they were previously used to. Of course, the automatic processing tools of HYSWEEP® software make it easy to process all this data. Really!

CUBE TERMINOLOGY

CUBE: *Combined Uncertainty and Bathymetry Estimator* which provides error modeling, automated data cleaning and reasonable bathymetric estimates. It was invented to speed processing of multibeam data while providing uncertainty information to validate the results.

CUBE Node: A bathymetric estimation point, including the uncertainties involved with the estimation.

CUBE Grid: A regularly spaced grid of CUBE nodes encompassing the survey area.

Depth Hypothesis: Each CUBE node has one or more depth hypothesis. In this context, a hypothesis is a set of soundings, consistent within themselves, leading to a reasonable depth estimate.

Hypothesis Strength: See ratio.

Multiple Hypotheses: More than one depth hypothesis may exist within a node. Consider sounding over a school of fish; perhaps half the soundings are returned by the fish and the other half are bottom returns. Each set of soundings (depth hypothesis) is consistent within itself, but CUBE is constrained to choose only one.

Multiple Hypothesis Disambiguation: Choosing the correct depth hypothesis from 2 or more. Automatically done in CUBE by comparison with surrounding nodes. Of course the user has the option of over-riding that selection.

Ratio: Indicator of the strength of the depth hypothesis, zero being best and 5 being worst. **Ratio = 5 – ns / (na – ns)** where:

ns = # depth samples in selected hypothesis and,

na = # depth samples in all hypotheses.

Examples from strongest to weakest:

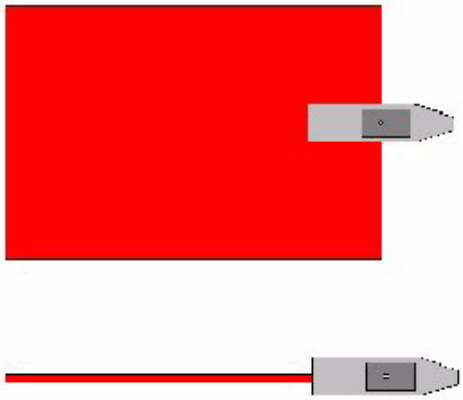
- In the case where there are 2 hypotheses, the selected hypothesis with 40 samples and the alternate with 10,
  ratio = 5 – 40 / (50 – 40) = 1.
- In the case where there are 2 hypotheses each with 20 samples,
  ratio = 5 – 20 / (40 – 20) = 4.
- In the case where there are 3 hypotheses each with 20 samples,
  ratio = 5 – 20 / (60 – 20) = 4.5
- In the case where there are 2 hypotheses, the selected hypothesis with 10 samples and the alternate with 40,
  ratio = 5 – 10 / (50 – 10) = 4.75.

Uncertainty: This is the 95% confidence level associated with each CUBE depth. It is a function of the variance of the soundings used in estimation.

SWEEP SONAR SYSTEMS

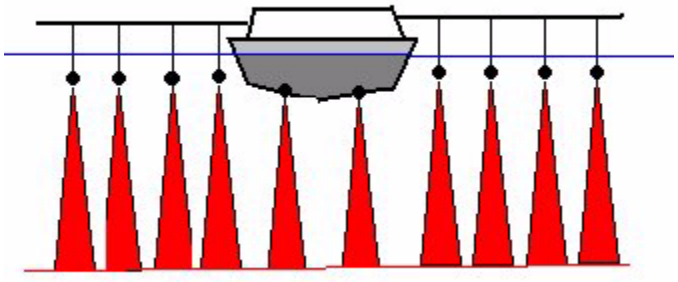
The fundamental idea behind sweep sonar is this; instead of sounding directly beneath the boat, as with single beam systems, the sweep sonars extend the soundings off to the sides. Hence, it is possible to sound an area (as opposed to a line) with a single pass. It is easy to see now why the terms sweep and swath are used. And when the sweep boat returns with some overlap in the ensonified area (ensonifies translates to illuminated by sound), it is clear why we speak of full coverage surveying.

FIGURE 10-1. *Map view of Sweep and single beam transducer boats. The Sweep boat sounds an area, the single bean boat sounds a line.*



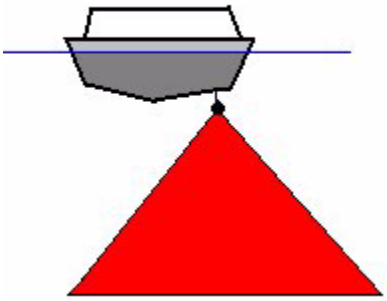
So, how is it that a sweep boat can sound off to the side? There are two methods supported by HYSWEEP® software and now we get a little subtle with the terms. The figure below shows what we call a multi-transducer system. The separation of the transducers allows for sweep coverage, even though the sonar beams are directed straight downward.

FIGURE 10-2. *Typical Multi Transducer System*



The second type is what we call multibeam. The sonar beams originate from the same approximate location, with sweep coverage attained through varying beam angles.

FIGURE 10-3. *Typical Multibeam System*

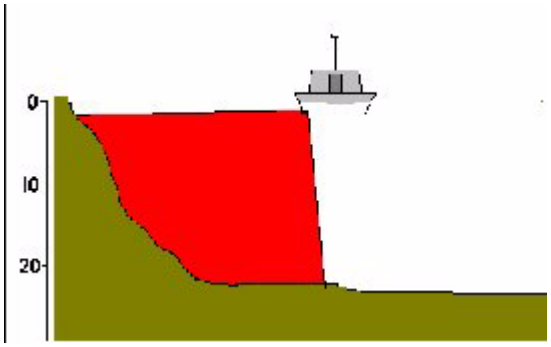


There are benefits and drawbacks associated with each type. Multi-transducer boats have a constant sweep width (usually referred to as coverage) regardless of water depth, making them well-suited for work in very shallow water. Note that the coverage is approximately 60 feet -- typical for boats working on the Mississippi River. Boats such as this are not suitable to rough waters due to the lengthy booms on which the transducers are mounted. Multi-transducer systems are relatively simple in theory and operation, just 10 (or 12 or whatever) transducers lined up next to each other. People with single transducer experience should have no trouble adapting to multi-transducer.

Multibeam boats can survey in much rougher water, with certain disclaimers. We have seen good results with up to 3-foot heave and +/- 10 degrees pitch and roll, but there is a limit. Multibeam systems offer greater coverage in moderate water depth. In the figure to the right, with water depth of 20 feet and fan of 90 degrees, the sweep width is approximately 40 feet. With this configuration, coverage is twice water depth, so beyond 30 feet, the coverage is greater than with the multi-transducer.

Some multibeam sonars can be tilted as shown in Figure 10-4 for bank and jetty surveys. They may also be purchased with angular coverage of much greater than 90 degrees.

FIGURE 10-4. *Multibeam Sonar Tilted to survey a Jetty*



The power of the multibeam sonars is that the narrow beams may be directed at practically any angle with great accuracy. These directed beams are also the source of all the complications including acoustic refraction, pitch and roll compensation, patch tests, etc. That's why training courses are offered!

BACKGROUND CHARTS SUPPORTED IN HYPACK®

HYPACK® supports a wide rance of electronic charts. They are used in HYPACK® and the survey and editing programs to lend context to your work.

- **AML charts** are similar to S57 charts and have limited support in HYPACK®. The basic charts can be displayed, but full support in the ENC EDITOR is *still under development*.
- **ARCS Chart Files:** The Admiralty Raster Chart Service (ARCS) is the digital reproduction of Admiralty charts for use in electronic navigational systems. They are available for most areas of the world. The ARCS charts installation includes a geo-referencing routine to align your charts properly according to the geodesy settings in your project. To display these charts, your dongle must be specially encrypted for this purpose. Keys issued before January 2004, must be updated with this encryption.
- **ArcView Shape Files** are line and polyline shape files (*.SHP) are available from ArcView and ArcInfo. For each SHP file, you can specify the line color, the fill color and the file type. Currently, we do not draw the text or allow access to any attribute data. We are studying the format to determine how we can improve the use of these files.
- **BSB Chart Files (*.KAP and *.CAP)** are commercially available raster chart files. These files contain electronic chart information and are based upon a particular ellipsoid and projection. For proper alignment of these charts, the geodetic parameters of HYPACK® should be set to match those of the BSB chart. Unencrypted, version 3 charts covering regions in the United States may be downloaded, free of charge, from either the NOAA site (http://www.nauticalcharts.noaa.gov/staff/charts.htm) or www.freeboatingcharts.com sponsored by Maptech HYPACK® supports through version 4 charts.

FIGURE 10-1. *BSB Chart in HYPACK®*

- **C-Map Chart Files** are commercially available vector chart files. These files are encoded a simplified Mercator projection, based on WGS-84. HYPACK® re-computes the WGS-84 position for each object, transforms it to the local datum and then computes the X-Y coordinate on the local projection. This enables you to accurately display C-Map data on any projection.

  HYPACK® supports the display of C-Map CM93 Edition 2 charts. Due to changes in C-Map's encryption scheme, we are unable to support Edition 3 C-Maps.

  C-Maps may be purchased directly from C-Map or from any of their dealers worldwide:

  C-Map USA, Inc.

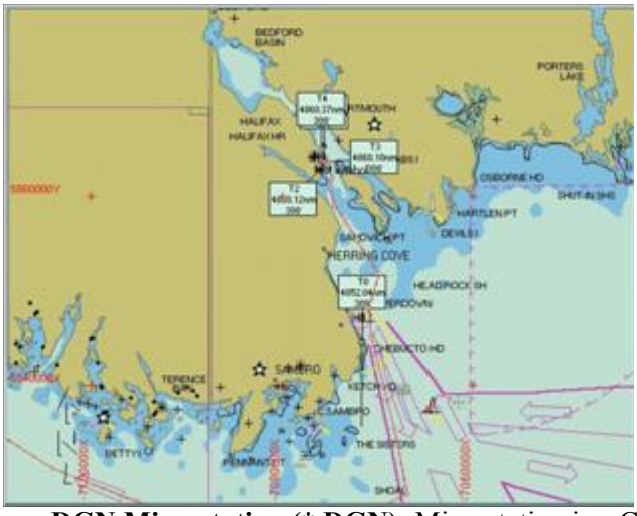
  133 Falmouth Rd., Building II

  Mashpee, MA 02649

  phone: 1-800-424-2627

  web: www.c-map.com

FIGURE 10-2. Viewing a C-Map in HYPACK®



- **DGN Microstation (*.DGN):** Microstation is a CAD package, similar to AutoCAD. It saves its data in DGN (Design) files, which is a vector-based binary format. HYPACK® can display most point, line, circle, arc, polyline and text objects from a DGN file.

TABLE 10-1. Comparison of DGN version 7 vs version 8 in HYPACK®

Program	DGN v8	DGN v7
Display in HYPACK® Shell, HYPLOT and SURVEY	x	x
Query Objects		x
EXPORT from EXPORT TO CAD		x
Source charts in ENC EDITOR and CHANNEL CONDITION REPORTER		X

DGN stores its information in an X-Y coordinate system. The X-Y coordinate systems of your DGN drawing must be based upon the projection system selected in the GEODETIC PARAMETERS program of HYPACK® to be properly located on the screen.

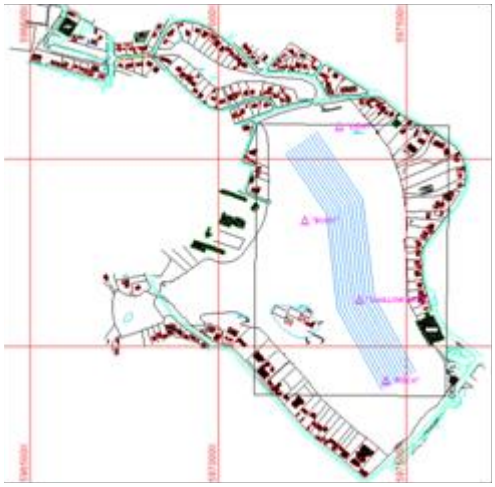
- **DGW format** is digitized hydrographic information created in the HYPACK® CHART and DGW EDITOR programs.
- **DG2 format** is a HYPACK® chart digitized in the DG2 EDITOR. This format replaces the DGW format with improved chart symbols and attributes available to describe your project area
- **DIG format** was used in early versions of HYPACK® (DOS included) to store digitized hydrographic information.

FIGURE 10-3. *DIG file in HYPACK®*

- **DXF Format** is a standard vector format that can be output by many different CAD or GIS packages. HYPACK® supports through DXF version 13 format

  DXF stores its information in an X-Y coordinate system. The X-Y coordinate systems of your DXF drawing must be based upon the projection system selected under the Geodetic Parameters section of HYPACK®. Otherwise, your data will not be properly located on the screen

FIGURE 10-4. *DXF File in HYPACK®.*



- **JPEG2000 and MrSID** charts are high-compression lossless images. They provide high resolution displays with minimum file size.
- **S57 Version 3 (*.000)** is the International Hydrographic Organization's Transfer Standard for Digital Hydrographic Data. It is an object-oriented format, which contains both spatial and attribute information for chart features. This information is stored in WGS-84. HYPACK® can transform the position to the user's local datum and then draw it correctly on the local projection. Objects are displayed

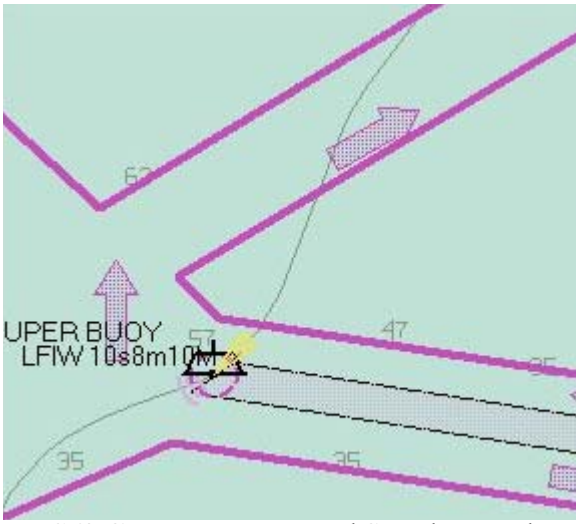
only when you are zoomed in closely enough to avoid excessive clutter in the display.

The HYPACK® Query tool displays attribute information about objects in S57 charts.

Many US charts are available, free for download, from the web.

- Coastal areas from NOAA (http://chartmaker.ncd.noaa.gov/mcd/enc/)
- Many rivers from the Army Corps of Engineers (http://www.tec.army.mil/echarts/inlandnav/)

FIGURE 10-5. *S57 Chart in HYPACK®).*



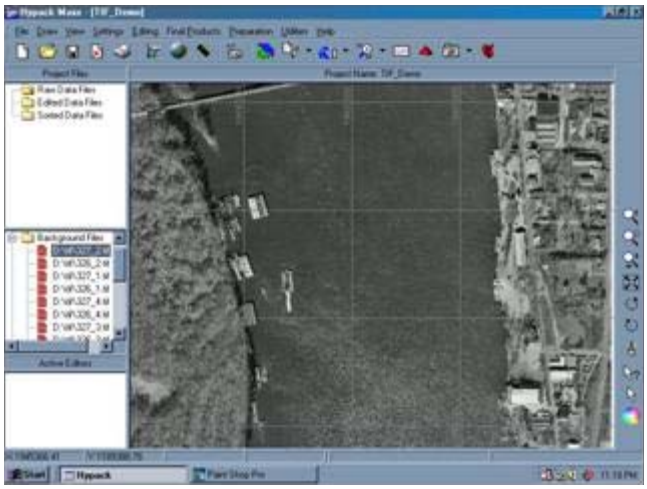
- **S63 Charts** are encrypted S57 charts. They are encrypted using the IHO Data Protection Scheme. In HYPACK®, you must load the certificate and the permits for the charts you are using before they can be displayed in your project.
- **SHP Charts (*.SHP)** are digital charts available through Environmental Research Systems Institute, Inc. (ERSI.Inc.). We currently only support drawing the main chart file, which define points, lines and areas in HYPACK®. (There are no attributes drawn.) In HYPACK®, you can enhance the chart display by assigning colors and textures and line weights.

NOTE: Be sure these shape files are referenced to your local coordinate system. Files referenced in decimal degrees, which will not be correctly positioned in HYPACK®.

FIGURE 10-6. SHP files in HYPACK®

- **TIF Orthophoto (*.TIF):** HYPACK® can also draw Orthometric Photo data that is stored in registered TIF format. Each TIF file must have an accompanying *.TFW file which contains the number of pixels (X vs. Y) and origin information for the photo. Both files come from the same source and must be stored together in the same directory. The X-Y information must be on the same datum and projection as specified in the Geodetic Parameters of HYPACK®. TIF files may be:
  - Obtained commercially
  - Created from HSX format side scan data in the SIDE SCAN MOSAIC program
  - Exported from the TIN MODEL program.
  - Exported from HYPLOT
  - Created in the main HYPACK® program.

FIGURE 10-7. TIF Photo in HYPACK® XE "TIF files"



- **VPF Vector Product Format** is a vector-based format, developed and used by the U.S. Department of Defense. It contains WGS-84 based chart features that are displayed in the HYPACK® overlay and during the SURVEY program. HYPACK® will transform the WGS-84 coordinates to the local datum before converting it to X-Y

coordinates on your projection. VPF files require special routines and are found under the “Draw” menu of HYPACK®. They are not accessed from the Background Files section as the other file types.

FIGURE 10-8. *VPF File in HYPACK®*

More Information

- “Area Map Views” on page 1-39
- “Background Charts” on page 2-3

S57 BASICS

One of the many changes in the hydrographic field over the past ten years is the use of S57 for the storage, presentation and transfer of digital chart data. HYPACK, Inc. has been working for several years to be able to present S57 format files in our HYPACK® and other packages. As a result of this work, we have developed the ENC EDIT program to create, maintain and update S57 chart data.

'S57' is shorthand for Special Publication No. 57, "IHO Transfer Standard for Digital Hydrographic Data". IHO is the acronym for the International Hydrographic Organization.

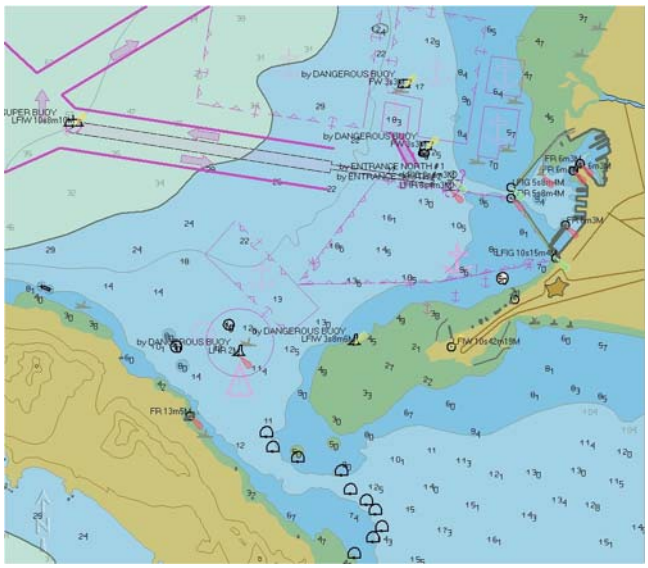
This 'S57 Basics' section provides a simple and straight-forward overview of the S57 format to de-mystify how data is stored and managed.

FEATURE AND SPATIAL DATA

An S57 file contains digital chart information that is divided into **feature** and **spatial** data.

A **feature** is some kind of object, such as a buoy, or a rock, or a traffic separation zone or a light or one of several hundred available objects in S57. There are point objects (buoys, wrecks, lights, etc), polyline objects (pipelines, cables, roads, etc.) and closed polygon objects (depth areas, anchorages, shoreline, etc).

FIGURE 10-1. *A Typical S57 Chart*



Each feature can be further described by a list of available **attributes**. For example, the lateral buoy shown in the lower right of the figure contains the following attribute information:

- BOYSHP: [spherical]
- CATLAM: [preferred channel to port lateral mark]
- COLOUR: [orange]
- INFORM: [LIMITE DE PESCA]
- SCAMIN: [100000]
- STATUS: [permanent]

Each attribute is described by a six-letter abbreviation. Thus, BOYSHP = Buoy Shape, SCAMIN = Scale Minimum. Each attribute can require a user entry, a single user choice from a list, or multiple user choices from a list.

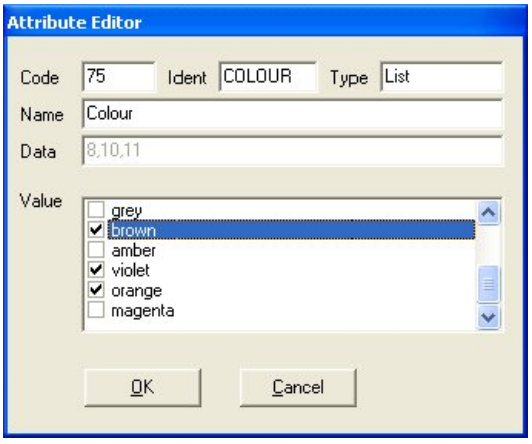
Example 1:

FIGURE 10-2. *Attribute Editor For The INFORM Attribute*

The Attribute Editor for the INFORM attribute allows you to enter a single line of text. In this case, we have entered 'Fishing Limit'.

Example 2:

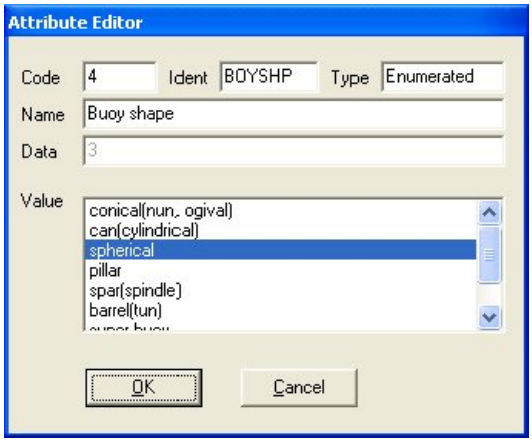
FIGURE 10-3. *Attribute Editor For The COLOUR Attribute*



The Attribute Editor for the COLOUR attribute enables you to select a single color or multiple colors to describe the object. [In this example, we have the famous brown, violet and orange buoy, used to denote islands inhabited by people with no sense of color coordination.]

Example 3:

FIGURE 10-4. *Attribute Editor For The Buoy Shape Attribute*



In the Attribute Editor for the BOYSHP (Buoy Shape) attribute, you can only select one item from the available list.

So, a feature tells us what kind of object we have and there are attributes assigned to the feature to tell us some more details. We haven't yet described where the object is located. That is done with the spatial data.

Spatial data is a fancy way of saying 'where is the feature located'. In the S57 format, the locations of objects are described by their WGS-84 positions. Although a user interface might allow you to enter and display the spatial data on a local coordinate system, in the background of the S57 file, all the S57 data is being written as a geographic coordinate (Latitude and Longitude) in WGS-84.

NODES, CHAINS AND AREAS

It would have been simpler if Nodes, Chains and Areas were named Points, Lines and Areas respectively.

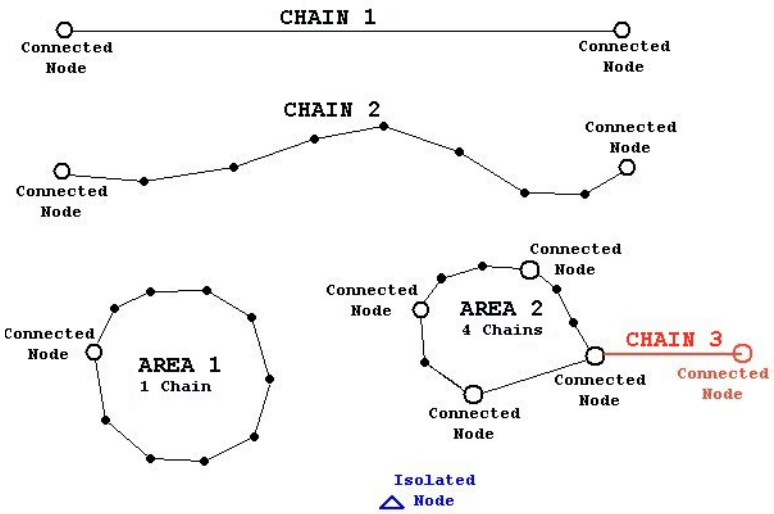
One of the favorite buzzwords of S57 experts is 'chain-node topography'. It's a fancy way of saying that everything in your S57 file is either a point ('node') or a series of lines ('chains'). Sometimes the lines form an enclosed shape ('area').

A **node** is a single spatial data point, composed of a WGS-84 coordinate pair. There are two kinds of nodes, isolated and connected. An **isolated node** represents the position of a point feature, like a buoy or a rock or a wreck. It can't be used for anything else.

A **chain** (also referred to by some as an 'edge') is a line or a polyline, constructed between two or more coordinate pairs. At each end of the edge is a **connected node**. We can connect one chain to another by either having them share the same connected node or by making another chain that connects their connecting node with a single line.

An **area** is a series of chains (or a single chain) that starts and ends at the same connecting node. In other words, it's a polygon that describes an area. An area can contain multiple chains (and multiple connecting nodes) or can be comprised of a single edge that starts and ends at a single connecting node.

FIGURE 10-5. *Sample Nodes, Chains and Areas*



In this figure:

CHAIN 1 consists of a single line drawn between two connected nodes. This is the simplest of chains.

CHAIN 2 shows a series of coordinate pairs, terminated by connected nodes. This is more typical of a chain.

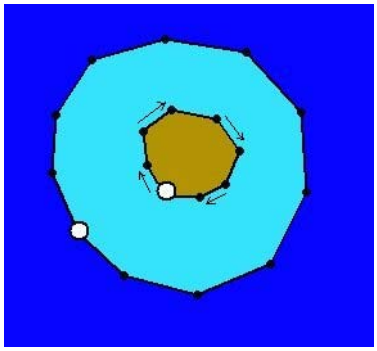
AREA 1 shows an area constructed from a single chain. It starts and ends on the same connected node.

AREA 2 shows an area constructed from four chains. It is very typical for a area to consist of multiple chains.

CHAIN 3 takes off from a connected node. This is also very typical, as several features may share the same connecting nodes.

One of the things to keep in mind when you define an area is that as you move along a chain that bounds the area, the enclosed area is always off the right side of the chain.

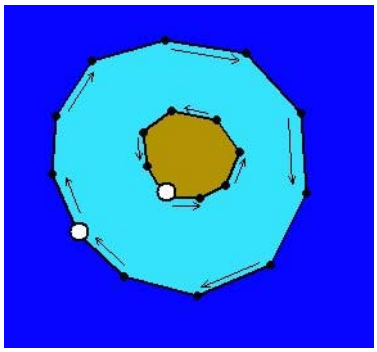
FIGURE 10-6. *Defining an Area*



Take a look at the graphic above that shows an island (brown), surrounded by a Depth Area (0m to 5m in Light Blue), surrounded by a deeper depth area.

When we create the chain that describes the island as a 'Land Area', we need it to go counter-clockwise. That way, the area we are interested in defining is to the right as we travel around the chain.

FIGURE 10-7. *Defining an Area*



Now take a look at the graphic used to define the Depth Area. We need to define an area with a hole in it. This is done by defining one polygon along the outside and a second polygon along the inside.

Note that the chain defining the outside goes in a counter-clockwise direction, keeping the Depth Area to the right. The chain surrounding the hole (island) travels in a clockwise direction, meaning the depth area is to the right.

Luckily, we can use the same chain to define the Land Area and the inside of the Depth Area. When I select a chain to be used in the definition of an area, I can 'reverse' the direction of the chain when used by a particular feature.

COMBINING FEATURES AND SPATIAL DATA

The S57 format stores feature and spatial data as separate records. Each feature record contains information as to what spatial record(s) applies to the feature.

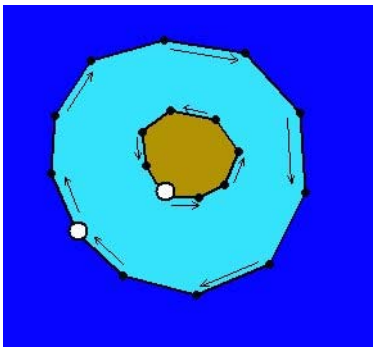
When I want a new buoy to be included in my S57 file, I first create the buoy 'feature' and specify the attributes for the buoy. I then give it the position where I want it to place the buoy. A new **feature record** will be created that contains the feature type and attribute info. A new **spatial record** will be created that contains the coordinate point (as an isolated node).

When drawing the S57 data, it comes across the new buoy in the feature records. It figures out what kind of buoy to draw and what labels are drawn with it from the attribute information in the feature record. The same feature record also contains the location of the spatial record that tells me where to draw the buoy. I open up the spatial record, get the coordinate pair for the buoy and then draw the feature at that location.

This seems a little crazy. Why not just keep the spatial data with each feature record?

One reason for the separation of feature and spatial data is that the same chain might be used for several different features. In our previous example with the island and the depth area, the same chain is used to create the Land Area and the Depth Area. Rather than listing the same set of points for each feature, we save space by only listing the points in one place.

FIGURE 10-8. *The Center Chain is Used to Define the Island and the Depth Area*

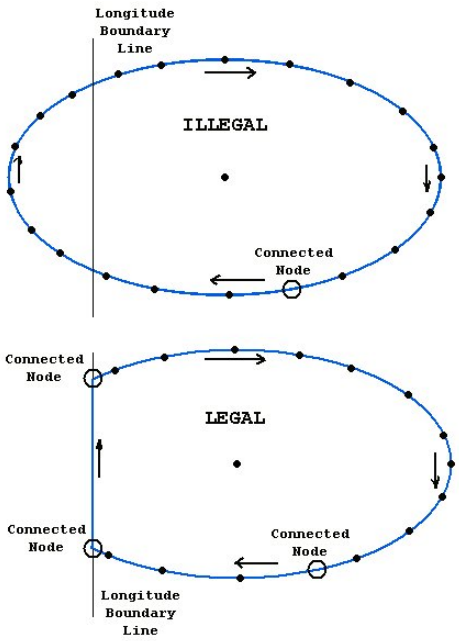


Also, by using this approach, if we change a coordinate pair in the chain used to define the Land Area, we are also automatically changing the coordinate pair used in defining the Depth Area. If each feature had its own set of separate coordinate lists, we would have to make sure that we changed the coordinate pair in every feature's coordinate list, instead of changing it in only one location in the S57 scheme.

BOUNDARIES AND CLIPPING

S57 files are 'bounded' by two parallels of latitude and two parallels of longitude. The area formed by the bounds is sometimes referred to as the 'bounding rectangle'. It's illegal to have any spatial data located outside the boundary area.

FIGURE 10-9. *Spatial Data can not be located outside of the Lat./Lon. boundaries of your area.*



In this graphic, the top chain would be 'illegal', because it contains coordinate pairs that are outside the bounding rectangle.

The lower series of chains forms a legal area. We created it with 'connected nodes' along the boundary line, as other features may want to take off from these points.

Some S57 Editors will either automatically clip your chains that pass outside the bounding rectangle while others will just notify you that you have an illegal chain.

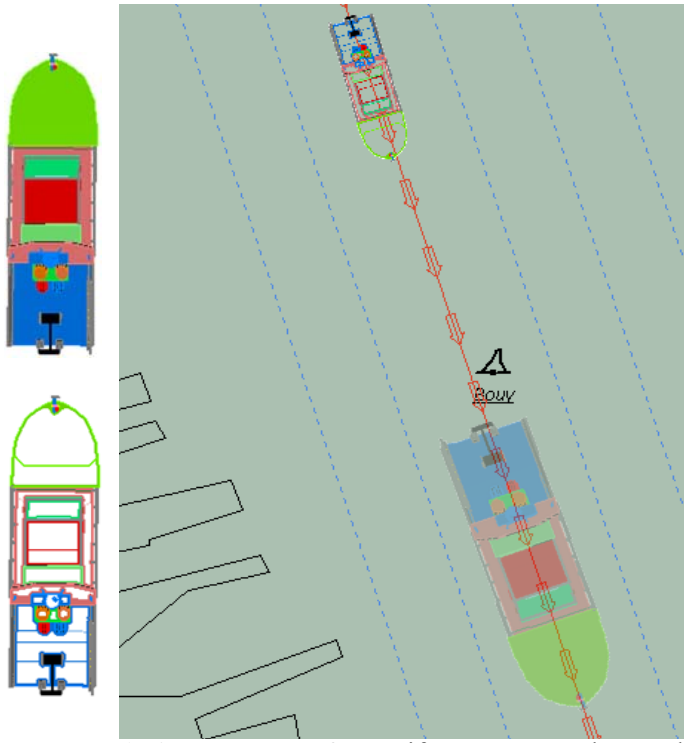
USING BITMAP IMAGES AS BOAT SHAPES

The SURVEY program allows you to use BMP files (in addition to SHP and DXF) for your boat shape.

The procedure requires several steps:

1. **Create the BMP file** using paint or any bitmap editor of your choice. Bear in mind that anything that is white in the BMP will be transparent in DREDGEPACK®. This means that all pixels outside of the boat border must be white. You may also use white for any part of your vessel that you want to appear hollow.
2. **Measure height and width of the picture in pixels and determine the boat origin** assuming that lower left corner is reference point.
3. **Create a text file (*.txt) file that has the same name as your BMP file**.
   - The first line must contain two integers that refer to boat origin determined in step 2.
   - The second line is the boat length in survey units.
4. **In SURVEY, and open the Vessel Setup dialog.**
   - **In the Shape tab:**
     - **Load the boat shape BMP file**.

FIGURE 10-1. *Sample BMP Boat Shapes--Shapes (left) in SURVEY (right)*



   - **Adjust the scale factor** if you want to change the original boat length.

- **Adjust boat transparency** level.

- **In the Map tab, check display shape**.

5. **Close the Vessel Setup dialog**.

The previous figure shows two vessels using the same bitmap and text file as follows:

```
Line 1: boat origin - 76 156
Line 2: boat length - 100
```

The first boat has scale = 2 and transparency 50%.

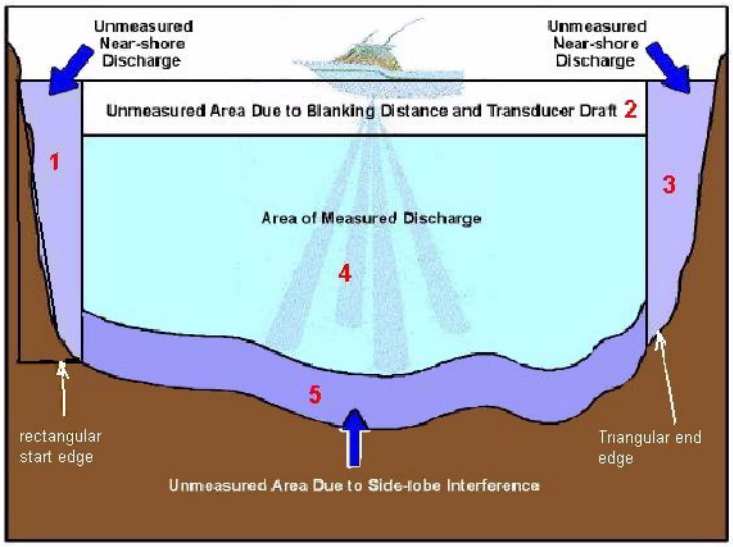
The second boat has scale = 1 and full transparency.

ADCP DATA - MEASURED AND CALCULATED

The behavior of water currents is affected by the proximity of solid surfaces such as channel side slopes and survey area bottoms. For this reason, ADCP data can be accurately measured at a distance from solid masses, the measurements taken close to solid surfaces must be calculated.

The following figure shows the areas in a survey area where discharge and volume data must be estimated.

FIGURE 10-1. *Areas Measured by ADCP*



Measured Area (4) : This is the area where the ensemble data lies. Discharge in all the other regions is calculated on the basis of this region.

Bottom Area (5) : The discharge in this region is estimated on the basis of last good bin data and the distance between that bin and bottom.

Top Area (2): This is the area between first good bin and water surface. Discharge is calculated on the basis of first good bin data, First good bin distance and adcp depth

Start Area (start edge 3): This is the distance between the FIRST ENSEMBLE and bank of river or channel from where survey line starts.

End Area (end edge 1) : This is the distance between the LAST ENSEMBLE and bank of river or channel from where survey line ends.

More Information

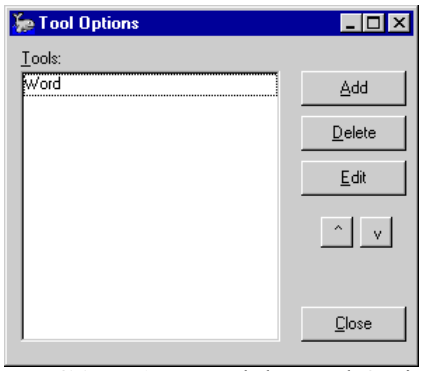
- "ADCP Profile" on page 8-145
- "ADCP In Situ" on page 8-119

LAUNCHING EXTERNAL PROGRAMS FROM THE HYPACK® MENU

You can use the TOOLS menu that will launch external executable files. Just another handy alternative to using the usual Windows® methods.

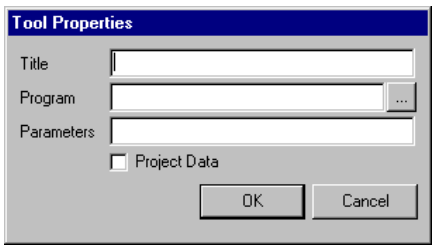
1. **Select TOOLS-SETUP.** The Tool Options dialog will appear.

FIGURE 10-1. *Tool Options dialog*



2. **Click [Add]** and the Tool Options Properties dialog will appear.

FIGURE 10-2. *Tool Options Properties dialog*



3. **Fill in the fields of the dialog then click [OK]** and close the program.

The contents of the Title field will now appear in the HYPACK® Help menu. In the future, when you select this menu item, it will launch the Program named in the second field and pass it any Parameters that you have listed.

The **Project Data** checkbox is for internal use at HYPACK, Inc. only.

You can add as many programs as you want in this manner and use the up and down arrow buttons to arrange their order if desired.

To remove programs from the menu:

Open the Tool Options dialog, select the program to be removed and click [Delete].

To change the properties of any listed program:

Open the Tool Options dialog, select the program then click [Edit]. The Tool Options Properties dialog will appear with the current data and you can edit it as desired.

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